5/17/00-01232

Final

Closeout Reports:

SWMU 2—Building Z-309 Ash Hopper Storage Area,

SWMU—3 Building Z-309 Oil/Lube Storage Area,

SWMU 40—MCA-603 Pits,

SWMU 41—CA-99 Golf Course, and

SWMU 42—CEP-201

Naval Station Norfolk

Norfolk, Virginia

Prepared for

Department of the Navy

Atlantic Division

Naval Facilities Engineering Command

Contract Task Order 0075

May 2000

Under the LANTDIV CLEAN II Program

Contract N62470-95-D-6007

Prepared by

CH2MHILL

CLOSEOUT REPORT FOR

SWMUs 2 3, 40, 41 AND 42

NAVAL STATION NORFOLK

In accordance with the Federal Facilities Agreement for the Naval Station Norfolk, signed February 1999, a desktop evaluation and Closeout Report were completed for Building Z-309 Ash Hopper Area (SWMU 2), Building Z-309 Oil/Lube Storage Area (SWMU 3), MCA 603 Pits (SWMU 40), Golf Course Disposal Area (SWMU 41) and Building CEP-201 (SWMU 42) at the Naval Station Norfolk. The site Project Managers and members of the Naval Station Norfolk Tier I Partnership determined that no further action is required and the land use will be unrestricted at each site. This evaluation was based on consideration of field sampling data for soil and groundwater, risk screening, and professional judgement. In the event contamination posing an unacceptable risk to human health or the environment is discovered after execution of this site closeout report, the Partnership agrees to remediate the contamination if deemed necessary.

Harry Harbold 5/17/2000

Harry Harbold Date
Project Manager
EPA Region 3

Devlin Harris 5/17/00

Devlin Harris Date
Project Manager
Virginia DEQ

Randy Jackson 5/17/00

Randy Jackson Date
Project Manager
Naval Facilities Engineering Command

Dianne Bailey 5/17/00

Dianne Bailey Date
Project Manager
Naval Station Norfolk

John C Tomik 5/17/00

John Tomik Date
Project Manager
CH2M HILL

Final

Solid Waste Management Unit (SWMU) Close-Out Reports: SWMU 2 – Building Z-309 Ash Hopper Storage Area, SWMU 3 – Building Z-309 Oil/Lube Storage Area, SWMU 40 - MCA-603 Pits, SWMU 41 - CA-99 Golf Course, and SWMU 42 - CEP-201

Naval Station Norfolk
Norfolk, Virginia

Contract Task Order 0075

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CH2MHILL

Herndon, Virginia

Table of Contents

Introduction

The Federal Facilities Agreement (FFA) for the Naval Station, Norfolk (NSN, previously named Naval Base Norfolk), which was signed by the Navy in February 1999, and by EPA on February 18, 1999, listed eight areas of concern (AOCs) identified as AOCs 1 through 8. The FFA requires that the Project Managers evaluate these AOCs and make a determination which ones require no further actions and which ones will proceed to the Site Screening Process (see next section) as Site Screening Areas (SSAs). For those AOCs that require no further action, a brief close out report is required.

Prior to the development of the FFA, various Solid Waste Management Units (SWMUs) at the NSN were included in the Baker Environmental Phase I (October 1995) and/or Phase II (September 1996) Relative Risk Ranking (RRR) Study. Additional information on selected sites were collected as part of the Solid Waste Management Units Supplemental Investigation conducted under the LANTDIV CLEAN II program (CTO 75).

In general, the RRR Study evaluation of the SWMUs focused mainly on the surface and subsurface soil, with limited groundwater sampling. The Department of Defense developed the relative risk framework used in the RRR study to evaluate the potential risk posed by a site in relation to other sites. Relative risk is a management tool that uses actual media concentrations, potential exposure, and potential migration to indicate which sites may pose a risk to human health and the environment. Based on the relative risk results, the Navy can focus available resources for study and remediation on the sites ranked "high". Each SWMU was given a relative risk designation in the RRR Study. Further discussion of the site ranking process is located in the Site Management Plan, 1999-2000, Naval Base, Norfolk.

The specific objectives of the supplemental investigation were to: (1) conduct sampling and analysis to fill information gaps; (2) identify and evaluate existing information by a review of the Relative Risk Ranking (RRR) System Data Collection reports; (3) conduct qualitative human health and ecological risk assessments; and (4) determine on a SWMU-specific basis if the site was a candidate for closeout as a No Further Action (NFA) site, or if further investigation or evaluation were warranted.

The following SWMUs were included in the supplemental investigation:

- SWMUs 9 and 10- the LP-200/MAC Terminal Area
- SWMUs 12 and 16 – Disposal and Accumulation Areas near NM 37
- SWMU 14 – the Q-50 Satellite Accumulation Area
- SWMU 28 – Area South of CEP 201
- SWMU 32 – SWD Area CEP 160/161 Embankment
- SWMU 33 – Debris Pile at Seawall- Corner of Sustain Pier
- SWMU 34 – SWD Area CEP 156/200
- SWMU 35 – SWD Area CEP 1966/Resolute Embankment
- SWMU 38 – CD Area behind Compost Yard
- SWMU 40 – MCA-603 Pits

- SWMU 41 – Disposal Area, CA-99 Golf Course
- SWMU 42 – CEP 201 Area

Samples were collected from various media at each SWMU during the RRR Study and the SWMU supplemental investigation. The analytical results of both investigations were combined and evaluated as one data set for each SWMU to determine the risks associated with the compounds detected on a qualitative screening basis. The screening process used to evaluate each SWMU is outlined in the following section.

The sites are shown in Figure 1-1. In addition, the information from the RRR study on two other SWMUs, SWMU 2 – Building Z-309 Ash Hopper Storage Area and SWMU 3 – Building Z-309 Oil/Lube Storage Area, indicated that they were suitable for close-out. The Close-Out Reports that follow are for five sites: SWMU 2, 3, 40, 41, and 42. For these sites, the available data indicate that they do not pose a threat to human health or the environment, and the current data are adequate to support an NFA determination.

SWMU Screening Process

An overall screening process outlined in the Federal Facilities Agreement (February 1999) was applied to all of the sites in the Naval Station Norfolk. Through that screening process, sites were categorized as follows (See Figure 1-2 and Figure 1-3 for process outline):

- Installation Restoration (IR) sites. These sites will follow the full CERCLA process and will require cleanup or the implementation of institutional controls (ICs) to protect human health.
- Site Screening Areas (SSAs). These sites will go through a site screening process that will either lead to an RI/FS or a decision document.
- Areas of Concern (AOCs). These areas go through a more streamlined process to determine if they should be classified as SSAs, if the area should closed out with no further action (NFA), or if additional evaluation is required to determine if the area should be classified as an SSA or be closed out (See Figure 1-4)

The sites discussed in this report were categorized as AOCs. The streamlined process to further evaluate the sites occurred as follows:

Concentrations of detected chemicals were compared to the following risk screening and regulatory criteria for each sample matrix: USEPA Region III risk-based concentrations (RBCs) for residential and industrial soil, USEPA Region III tap water RBCs, and USEPA national drinking water Maximum Contaminant Levels (MCLs) for groundwater. The USEPA Region III Biological Technical Assistance Group (BTAG) screening values for surface water and sediment were used for comparison only and not as FFA site classification or decision-making criteria. The SWMUs were initially categorized based on the comparison to screening and regulatory criteria (comparison criteria). The concentrations of chemicals exceeding these criteria were then compared to the upgradient concentrations (for groundwater), background concentrations (for soil) or offsite

concentrations (for surface water and sediment) to determine if the detected concentrations exceeded the upgradient, background, or offsite concentrations.[1]

The results of groundwater sampling did not factor significantly into the NFA evaluations. The groundwater samples were collected using direct-push technology. Groundwater samples collected using direct-push technology may not reliably represent actual groundwater conditions, and therefore are not used for quantitative risk assessment. The samples were used to make an initial evaluation of groundwater quality relative to the comparison criteria, and to see if any contaminants found at elevated concentrations in soils were also elevated in groundwater.

Concern over potential groundwater impacts of these sites is further mitigated because the City of Norfolk supplies all potable water to the City and to Naval Station, Norfolk, and there are no potable water supply wells at NBN.

Sites in the supplemental investigation where the qualitative groundwater results had significantly exceeded the comparison criteria, and where the groundwater exceedances were associated with elevated concentrations of contaminants in soils, were not included in this group of sites recommended for close-out as NFA sites on the basis of available data.

SWMU Close-Out Reports

Based on this screening process, five SWMUs are recommended as No Further Action (NFA) sites based on the available data:

- SWMU 2 - Building Z-309 Ash Hopper Storage Area
- SWMU 3 - Z-309 Oil/Lube Storage Area
- SWMU 40 - MCA-603 Pits
- SWMU 41- Disposal Area, CA-99 Golf Course
- SWMU 42 - CEP 201 Area.

SWMUs 2 and 3 are part of the same AOC and are combined in one report. No further evaluation or streamlined risk assessment is considered necessary for the above SWMUs. In accordance with the Federal Facilities Agreement, the close-out reports remove these SWMUs from the program. In the event contamination posing an unacceptable risk to human health or the environment is discovered after execution of this site close-out document, the Navy will undertake additional investigation or study to characterize the contamination and associated risk and will take appropriate action under CERCLA if deemed necessary.

For the other SWMU sites included in the Supplemental Investigation Study, additional risk assessment or additional investigation activities will be undertaken prior to making a determination on whether these sites are NFA, or if institutional controls or other remedial measures are required.

For SWMUs 2, 3, 40, 41, and 42, each close-out report is comprised of the following sections:

[1] At the time this screening process was conducted, data on background concentrations were limited to background soil sampling performed at the Slag Pile site. A base-wide study to collect and evaluate background soil conditions is underway. The results of this base-wide background study will be used in the evaluation of other SWMU sites.

Section 1 – Introduction: Includes the site description and a brief discussion of previous investigations.

Section 2 - Field Activities: Includes a brief discussion of previous field activities, including the numbers of samples collected, sampling techniques, sample locations, and the analyses performed.

Section 3 - Risk Characterization: Includes a discussion of the exceedances of comparison criteria by medium.

Section 4 - Conclusions and Recommendations: Summarizes the basis for the NFA determination

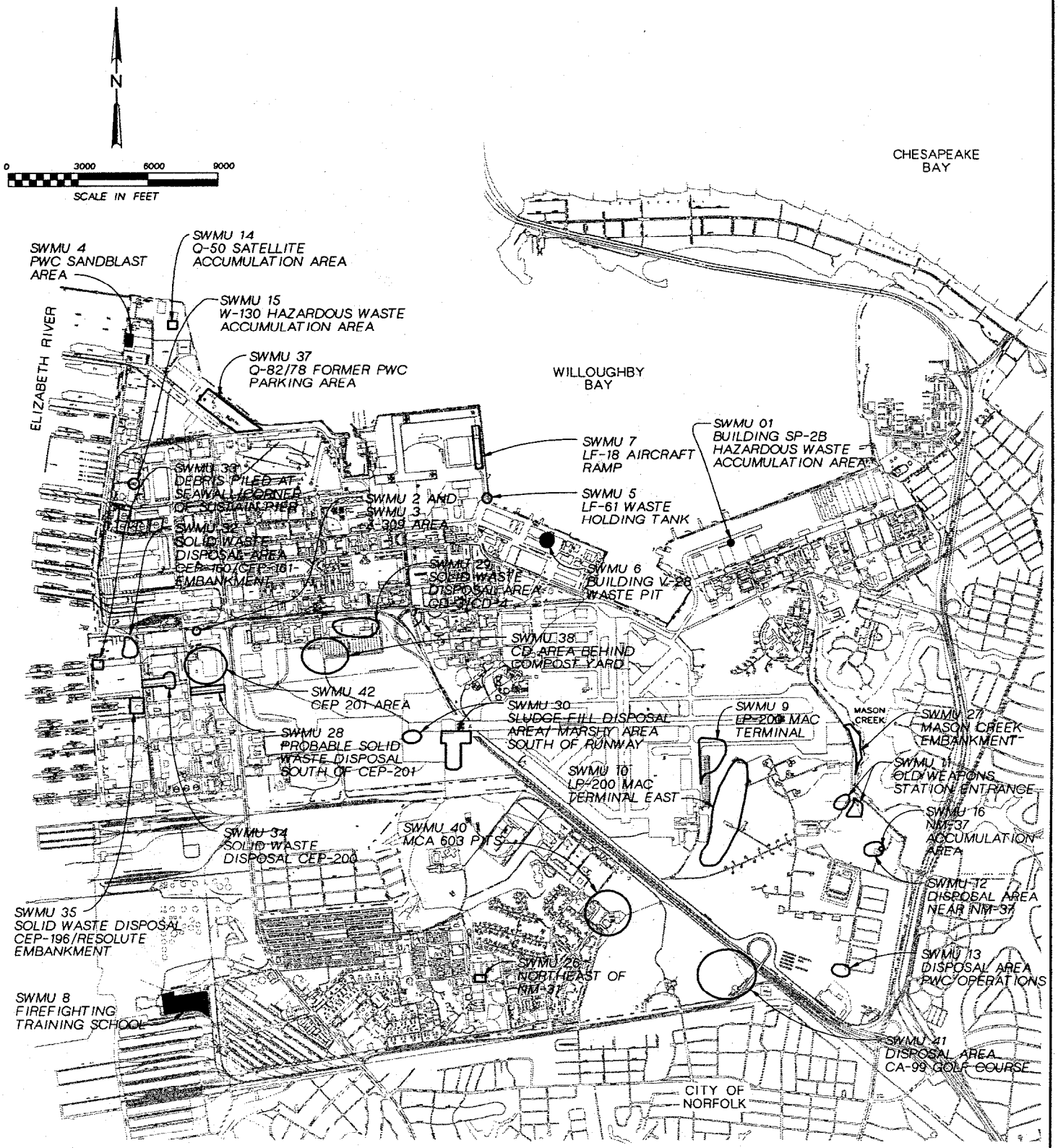

Figure 1-1

SOLID WASTE MANAGEMENT UNITS

Naval Base Norfolk

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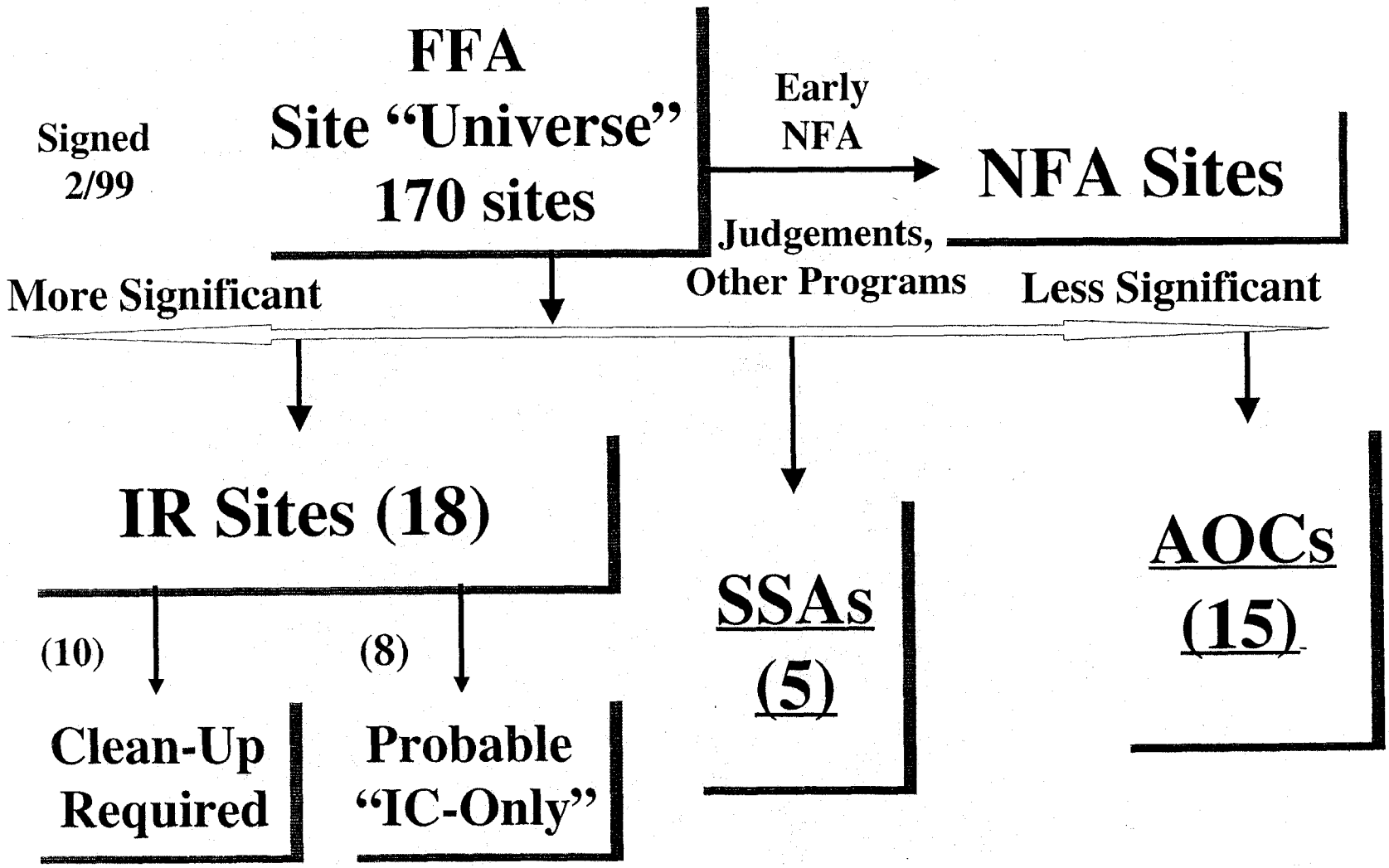

Figure 1-2, Outline of FFA Process

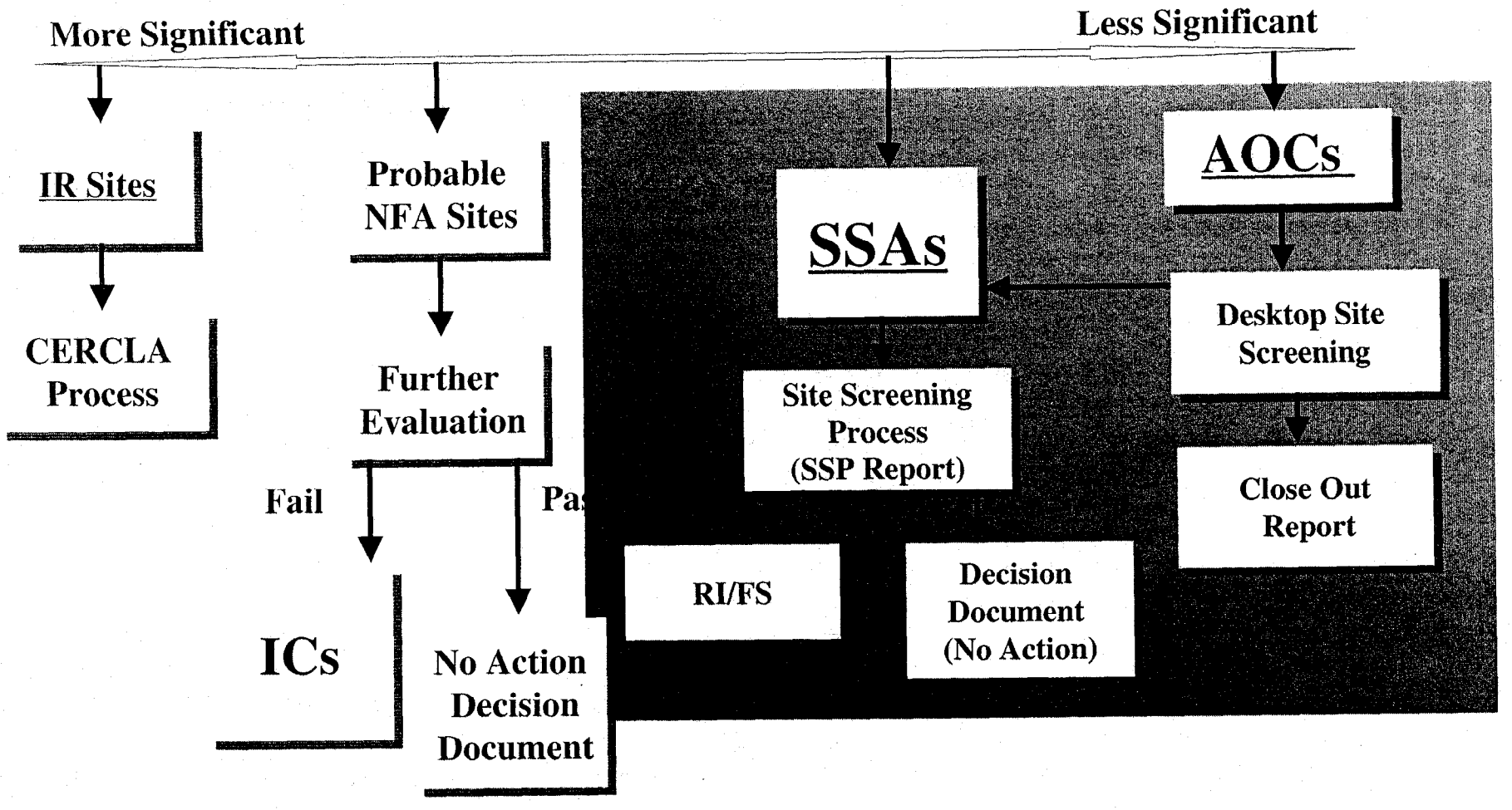

Figure 1-3, Screening Process for SSAs and AOCs

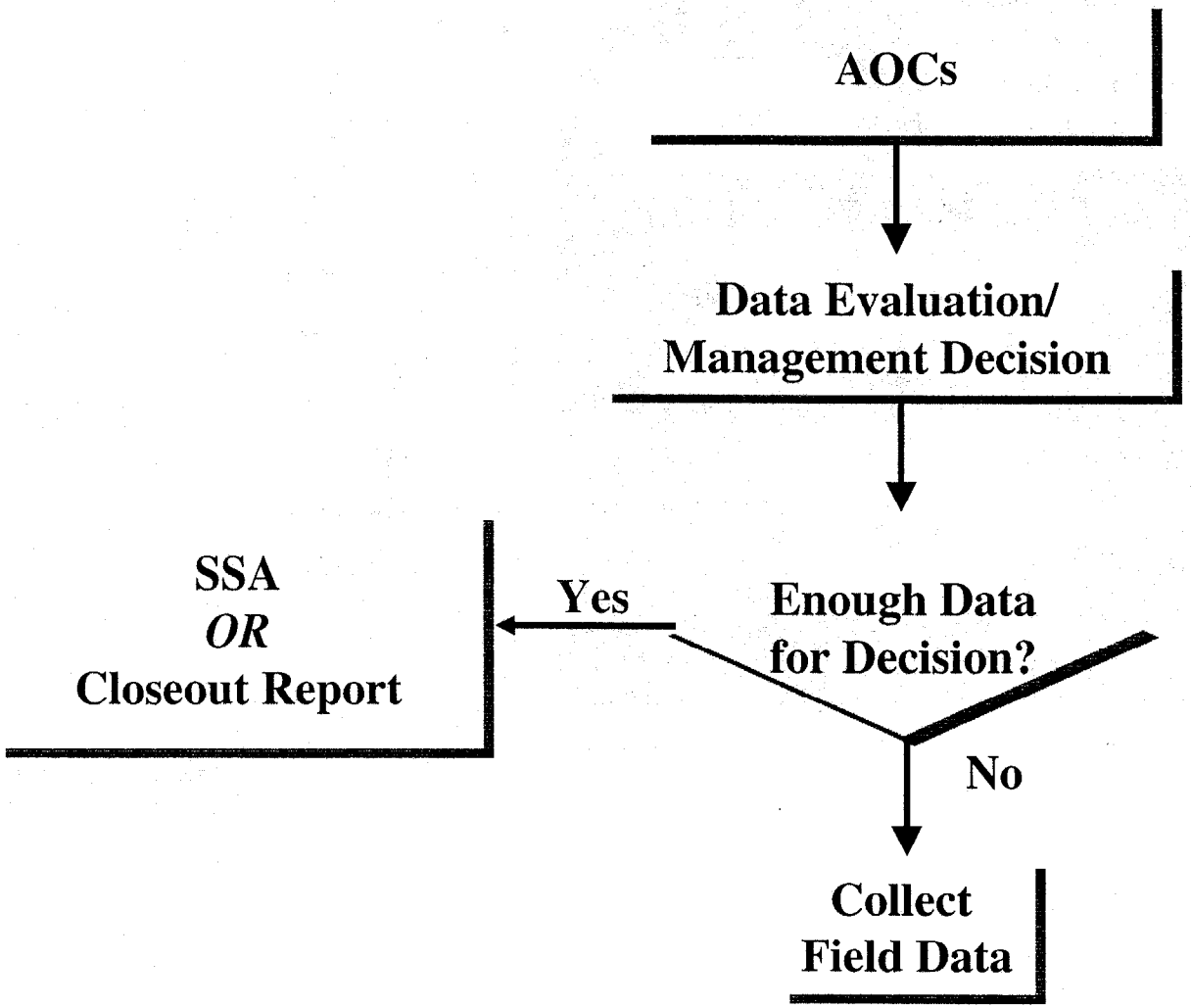

Figure 1-4, Detailed Screening Process for AOCs (Page 1 of 2)

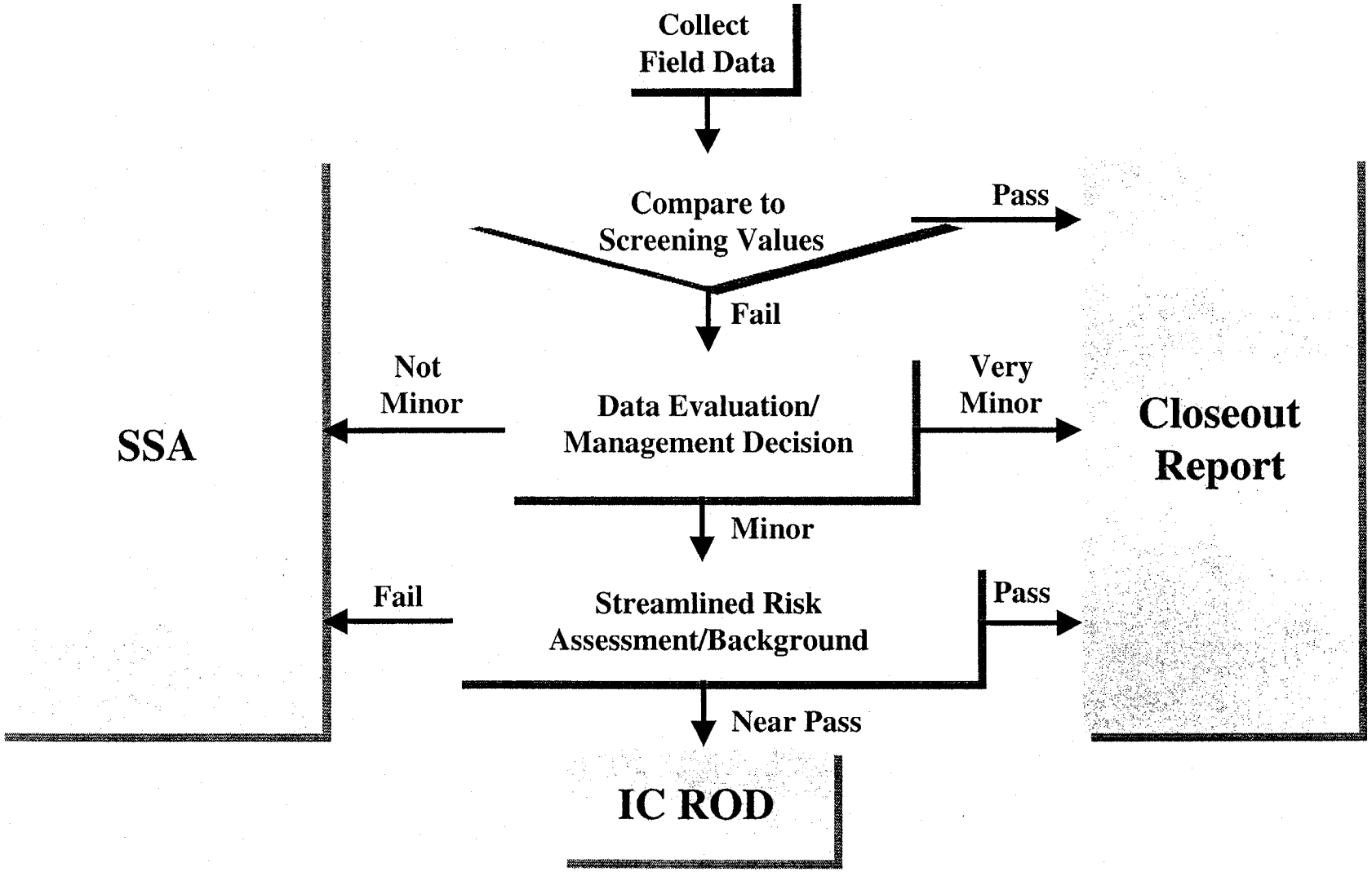

Figure 1-4, Detailed Screening Process for AOCs (Page 2 of 2)

SWMU 2:
Building Z-309 Ash Hopper Area
And
SWMU 3:
Building Z-309 Oil/Lube Storage Area

Section 1

Introduction

The Navy proposed in a letter dated May 3, 1999 that AOC 1 (SWMU 2 and SWMU 3) be classified as requiring no further action. This SWMU Close-Out Report presents the results of the environmental sampling and analysis performed at SWMU 2 – Building Z-309 Ash Hopper Area and SWMU 3 – Building Z-309 Oil/Lube Storage Area at the Naval Station, Norfolk (NSN), Norfolk, Virginia.

This report is organized into four sections. Section 1 describes the SWMUs, describes past land use and future land use possibilities for the SWMUs, and provides information regarding environmental investigations conducted at the SWMUs. Details on the number of samples collected, collection techniques, sampling locations and dates, and sample analysis are provided in Section 2. Section 3 presents a qualitative human health and ecological risk characterization. Conclusions and recommendations are presented in Section 4.

Site Description

SWMUs 2 and 3 are located at Building Z-309, in the western portion of the Base in the Northwest corner of the intersection of Virginia Avenue and Admiral Taussig Boulevard. This area is located adjacent to the trash transfer/recycling center. Aboveground storage tanks and underground storage tanks (ASTs and USTs) were identified in the area. The location of SWMUs 2 and 3 are shown on Figure 1-1 and Figure 1-2.

SWMU 2 is located outside the southern side of Building Z-309. This unit managed ash from boiler operations and operated from 1967 until 1986 when Building Z-309 salvage fuel boilers ceased burning municipal waste. SWMU 2 received ash from boiler operations in Building Z-309 and was emptied daily while in operation. The collected ash was sent to an off-site solid waste landfill. SWMU 2 is a conical steel hopper approximately 30 feet by 30 feet and elevated 12 to 15 feet off the ground. It is underlain by a concrete base sloped to a drain, and is surrounded on three sides by a 3-inch asphalt berm. Black stains were observed on the concrete base below this unit.

SWMU 3 is located near the southeastern corner of the building. The unit was used for storage of oils and lubricants used in the Z-309 area. Drums were stored horizontally on racks approximately 18 inches above a soil and gravel base. The area had a 2-foot wide by 6-inch berm on one side. The base of the area directly underneath the drums was observed to be heavily stained and partially covered with absorbent. Drip pans were present beneath the drum racks.

Building Z-309 was renovated in 1997 under a Navy Public Works project. Approximately 2844 square feet of the building on the south side that housed two large boilers was demolished, including the associated concrete slab. In addition, the components of the Ash

Hopper and Oil/Lube Storage Area were removed to below ground level. This included removal of the sludge in the ash trenching system, the blow down pit, paving, curb and gutter, railroad ties. This was the portion of the building that housed the two large boilers. A new parking lot was constructed in its place, and the remaining area was covered by topsoil and seeded. Therefore, both SMWUs 2 and 3 have been demolished and have received new backfill and paving. Photographs of conditions of the site are shown in Appendix B.

Previous Investigations

A facilities assessment (RFA) performed under the Resource Conservation and Recovery Act (RCRA) included SWMU 2 and SWMU 3 (referred to as AOC B). The RFA determined there was a moderate potential for release to the soil/groundwater due to the presence of soil surrounding the concrete pad in SWMU 2. The RFA also found a high potential for release to the soil and groundwater due to the presence of heavily stained soil beneath the drum racks in SWMU 3.

Sampling and analysis of the groundwater, surface soil, and subsurface soil were performed during the RRR study. SWMU 2 and SWMU 3 were referred to as Site No 17 and Site No 18 respectively. The sampling locations and a description of the RRR sampling activities are presented in Section 2.

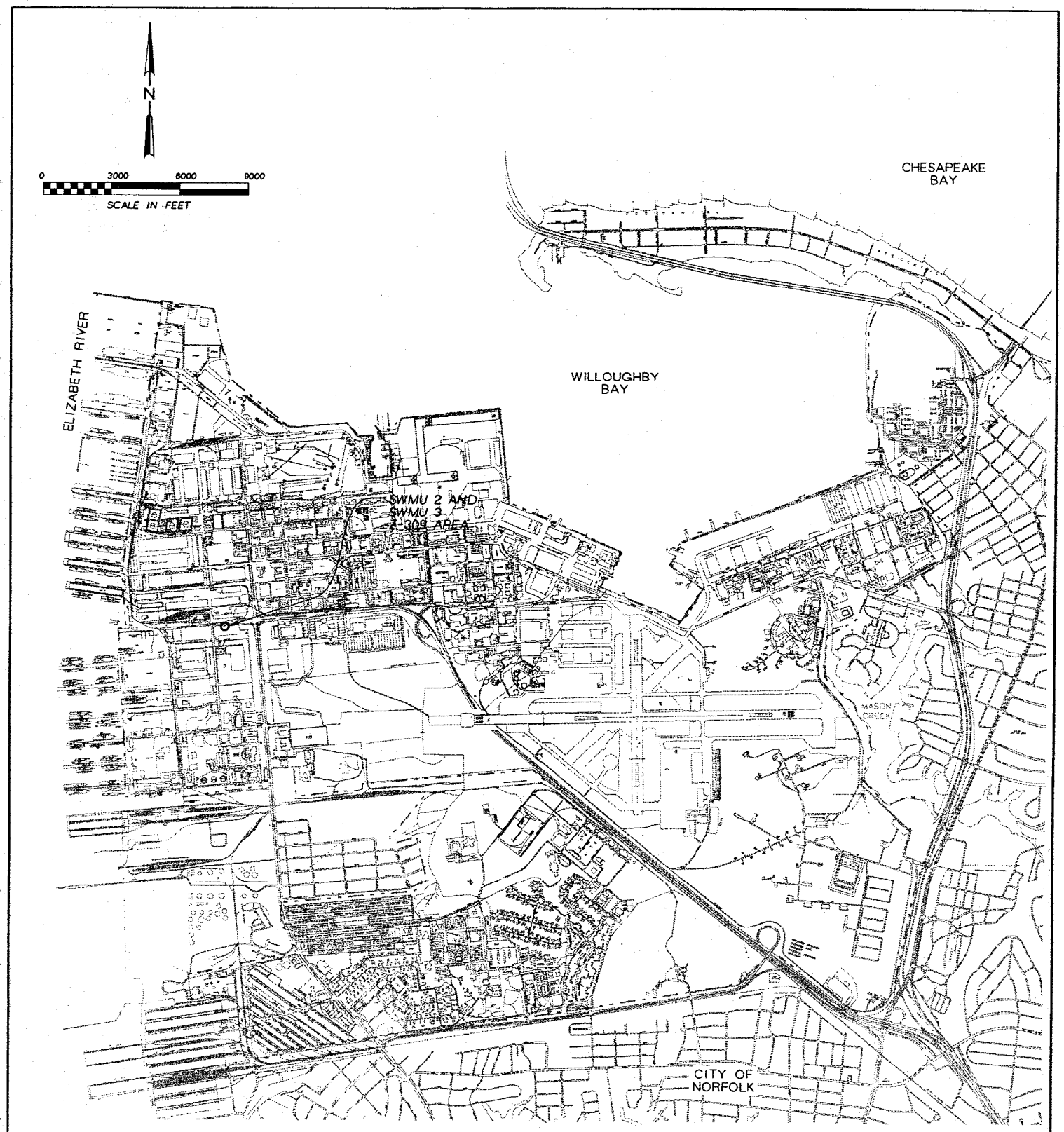

Figure 1-1
SWMU 2 & 3 - Z-309 AREA
Naval Base Norfolk

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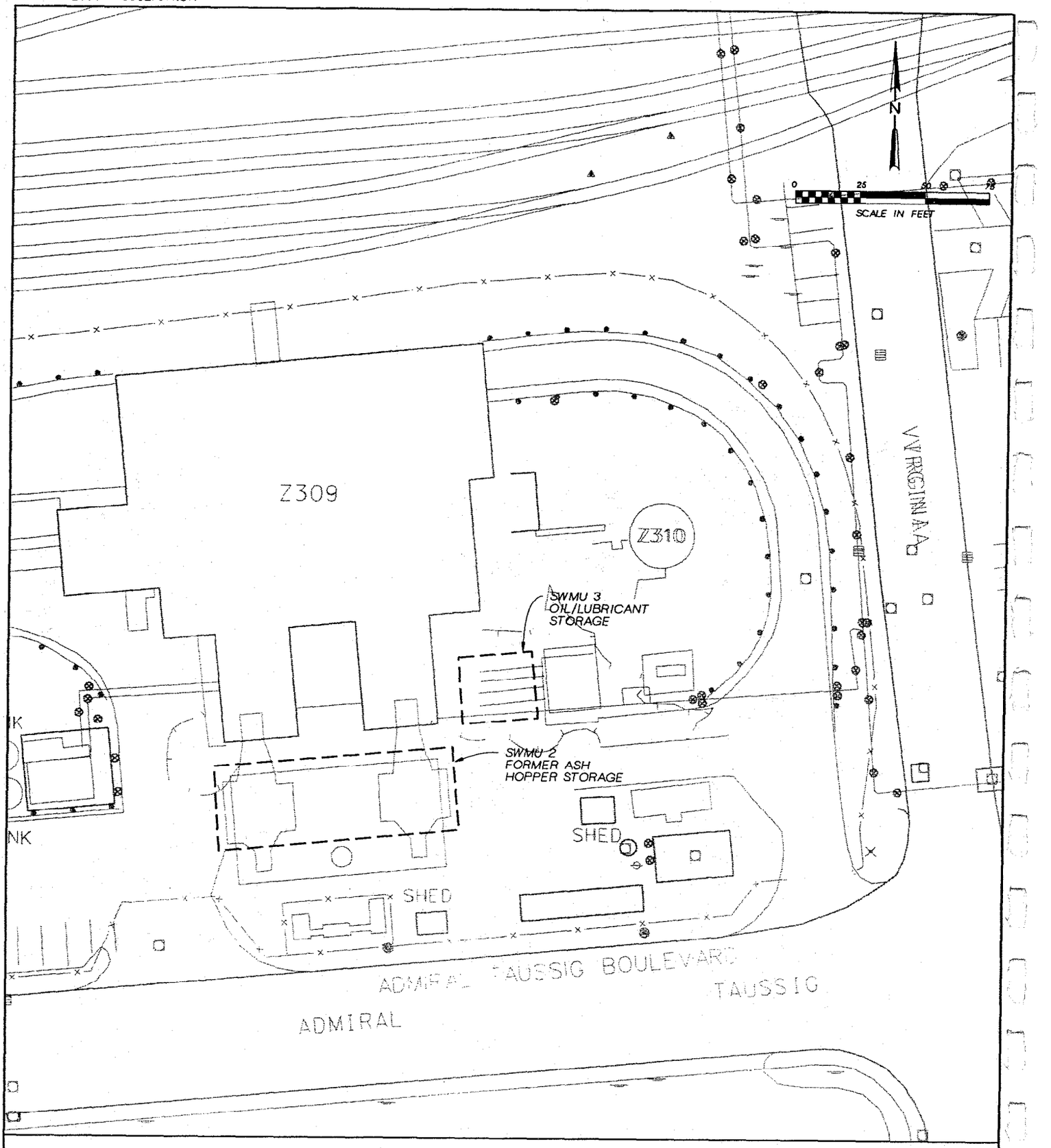

Figure 1-2
SITE MAP
SWMU 2 - BUILDING Z-309
FORMER ASH HOPPER AND
SWMU 3 - BUILDING Z-309
OIL/LUBRICANT STORAGE
Naval Base Norfolk

LEGEND

ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT

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Field Activities

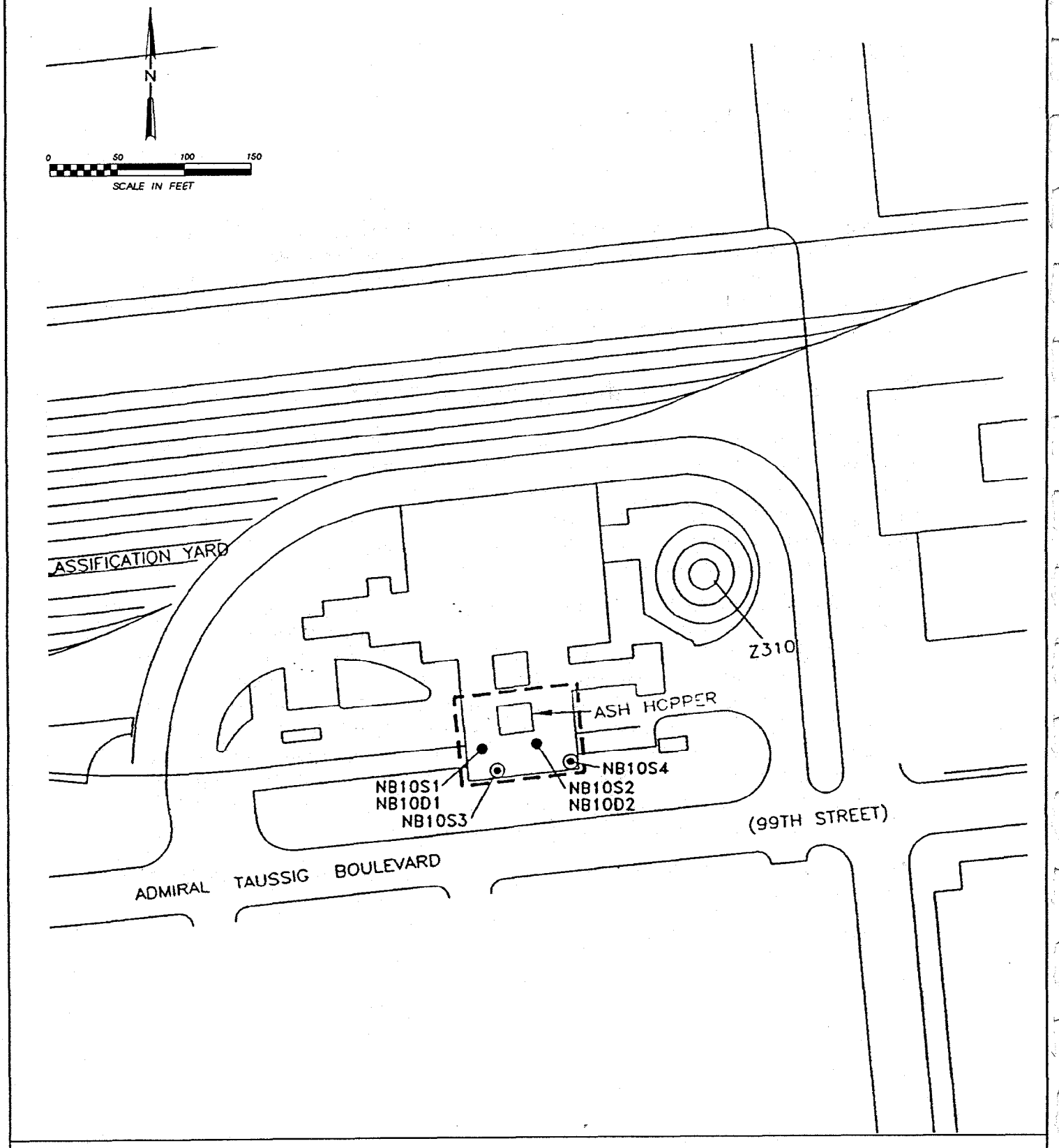
This section presents information related to the field activities associated with the sampling performed at SWMUs 2 and 3. Details on the number of samples collected, collection techniques, sampling locations, and sample analysis are provided. As noted in Section 1, demolition of SWMUs 2 and 3 occurred in 1997. Therefore, all sampling activities discussed below took place prior to renovation activities.

Supplemental Investigation Sampling Activities

Groundwater, subsurface soil, and surface soil samples were collected during the RRR sampling activities at SWMUs 2 and 3. All groundwater samples were collected using the Geoprobe® direct-push sampling technology from a depth of approximately 10 to 20 feet below ground surface. The Geoprobe® direct-push sampling technology was also employed during subsurface soil sampling. Surface soil samples were collected using disposable trowels to transfer the soil directly in to the sample containers.

Samples were collected for the RRR Study at two different times. During Phase I of the RRR study (October 28, 1995), two surface (NB10S1 and NB10S2) and two subsurface (NB10D1 and NB10D2) soil samples were taken at SWMU 2. At the same time, one surface sample (NB11S1), one subsurface sample (NB11D1), and one groundwater sample (NB11W1) were taken at SWMU 3. During Phase II of the RRR study (September 19, 1996), two surface samples (NB10S3 and NB10S4) were taken at SWMU 2 and four surface soil (NB11S2 through NB11S5) samples were taken at SWMU 3. All soil samples were analyzed for Target Compound List (TCL) VOCs, TCL SVOCs, TCL Pesticides and PCBs, and Target Analyte List (TAL) Inorganics. All groundwater samples were analyzed for TCL VOCs, TCL SVOCs, TCL Pesticides and PCBs, and TAL inorganics.

The SWMU 2 sampling locations are shown on Figure 2-1. The SWMU 3 sampling locations are shown on Figure 2-2.



LEGEND

NB10S1 •	SURFACE SOIL SAMPLING POINT OCTOBER, 1995
NB10D1	SUBSURFACE SOIL SAMPLING POINT OCTOBER, 1995
NB10S3 ⊙	NEW SURFACE SOIL SAMPLING POINT SEPTEMBER, 1996

SOURCE: LANTDIV 1995

Figure 2-1
SWMU 2 - Z-309 ASH HOPPER STORAGE AREA
SAMPLING LOCATIONS
Naval Base Norfolk

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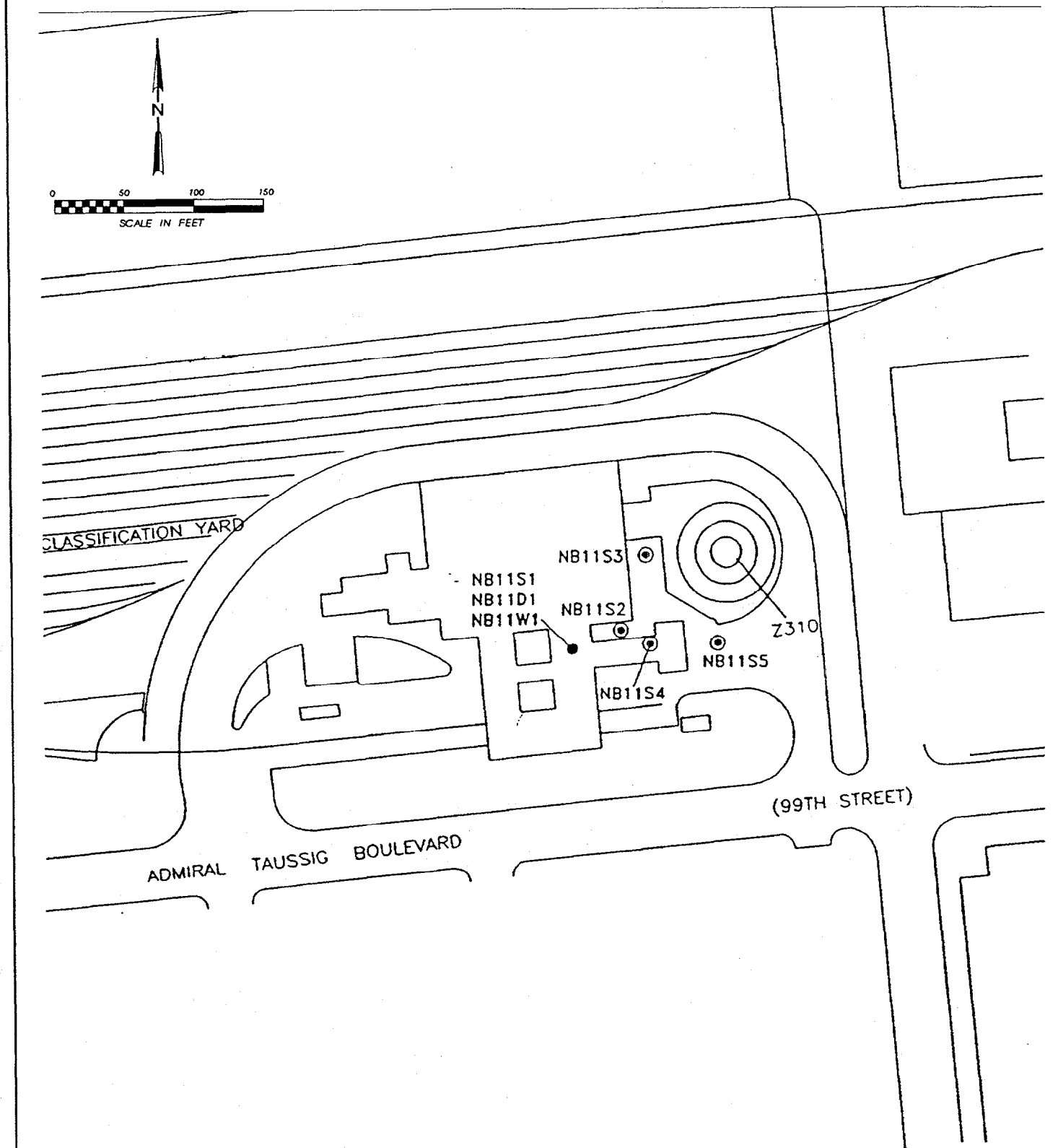

LEGEND

NB11S1 •	SURFACE SOIL SAMPLING POINT OCTOBER, 1995
NB11D1	SUBSURFACE SOIL SAMPLING POINT OCTOBER, 1995
NB11W1	GROUNDWATER SAMPLING POINT OCTOBER, 1995
NB11S2 ⊙	SURFACE SOIL SAMPLING POINT SEPTEMBER, 1996

SOURCE: LANTDIV 1995

Figure 2-2
SWMU 3 - Z-309 OIL AND LUBRICANT STORAGE AREA
SAMPLING LOCATIONS
Naval Base Norfolk

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Risk Characterization

The following sections present the interpretation of the analytical data from the RRR Study. The discussion includes the identification of screening/regulatory criteria exceedances, as well as exceedances of upgradient, background and offsite concentrations.

Analytical Results

The analytical results of the RRR Study are discussed in the following sections. Concentrations of detected chemicals were compared to the following current USEPA screening and regulatory screening criteria for each sample matrix: risk-based concentrations (RBCs) for residential and industrial soil, USEPA Region III tap water RBCs, and USEPA drinking water Maximum Contaminant Levels (MCLs) for groundwater. The USEPA Region III Biological Technical Assistance Group (BTAG) screening values were used for comparison only and were not used as FFA site classification or decision-making criteria.

Appendix A provides a compilation of the concentrations of all chemicals detected in samples collected during the RRR Study.

Groundwater

One groundwater sample was collected at SWMU 3 during Phase I of the RRR study field activities. No organic compound or inorganic chemical was detected at a concentration exceeding the screening or regulatory criteria (comparison criteria) in any groundwater sample.

Soil

Two surface and two subsurface soil samples were collected at SWMU 2 and one surface and one subsurface soil sample was collected at SWMU 3 during the Phase I RRR Study. Two surface soil samples were collected at SWMU 2 and four surface samples were collected at SWMU 3 during Phase II of the RRR Study. Chemicals detected at concentrations that exceeded the residential and/or industrial RBCs are listed in Tables 3-1 and 3-2.

Surface Soil Screening Criteria Exceedances

The following polynuclear aromatic hydrocarbons (PAHs) were detected at concentrations exceeding the screening criteria in soil samples at SWMU 2 during the RRR study: benzo(a)pyrene, benzo(a) anthracene, benzo(b)fluoranthene, dibenzo(a,h) anthracene, and indeno(1,2,3-cd)pyrene. Several inorganic chemicals - arsenic, antimony, and cadmium - were detected at concentrations exceeding the screening criteria at SWMU 2. Similarly, the

same PAHs as above were detected at concentrations exceeding the screening criteria in soil samples at SWMU 3. Only one inorganic chemical, arsenic, was detected at concentrations exceeding the screening criteria at SWMU 3 during the RRR study.

Arsenic was detected at all sampling locations in SWMU 2. The arsenic concentrations ranged from 7.90 mg/kg to 42.5 mg/kg, with all concentrations exceeding the residential RBC of 0.43 mg/kg. Antimony, cadmium, and the PAHs were only detected in NB10S4 at SWMU 2. Arsenic was detected in all but one of the sampling locations at SWMU 3. PAHs were detected mainly in NB11S2 and NB11S3.

Table 3-1
Surface Soil Exceedances
SWMU 2 and SWMU 3

Sample ID	Compound	Units	Value	Qualifier	Comparison Criteria	Criterion Value	Exceedance Quotient
SWMU 2							
NB10S1	Arsenic, total	mg/kg	12.0		RBC-Industrial Soil	3.82	3.10
NB10S1	Arsenic, total	mg/kg	12.0		RBC-Residential Soil	0.43	28.2
NB10S2	Arsenic, total	mg/kg	7.90		RBC-Industrial Soil	3.82	2.10
NB10S2	Arsenic, total	mg/kg	7.90		RBC-Residential Soil	0.43	18.6
NB10S3	Arsenic, total	mg/kg	23.2		RBC-Industrial Soil	3.82	6.10
NB10S3	Arsenic, total	mg/kg	23.2		RBC-Residential Soil	0.43	54.5
NB10S4	Arsenic, total	mg/kg	42.5		RBC-Industrial Soil	3.82	11.1
NB10S4	Arsenic, total	mg/kg	42.5		RBC-Residential Soil	0.43	99.8
NB10S4	Antimony, total	mg/kg	41.5		RBC-Residential Soil	31.3	1.30
NB10S4	Cadmium, total	mg/kg	108		RBC-Residential Soil	39.1	2.80
NB10S4	Cadmium, total	mg/kg	108		RBC-Residential Soil	78.2	1.40
NB10S2	Benzo(a)pyrene	mg/kg	0.15	J	RBC-Residential Soil	0.09	1.70
NB10S3	Benzo(a)pyrene	mg/kg	0.13	J	RBC-Residential Soil	0.09	1.50
NB10S4	Benzo(a)pyrene	mg/kg	1.10		RBC-Industrial Soil	0.78	1.40
NB10S4	Benzo(a)pyrene	mg/kg	1.10		RBC-Residential Soil	0.09	12.6
NB10S4	Benzo(a) anthracene	mg/kg	1.50		RBC-Residential Soil	0.87	1.70
NB10S4	Benzo(b) fluoranthene	mg/kg	2.10		RBC-Residential Soil	0.87	2.40
NB10S4	Dibenzo(a,h) anthracene	mg/kg	0.28	J	RBC-Residential Soil	0.09	3.20
NB10S4	Indeno(1,2,3-cd) pyrene	mg/kg	0.90		RBC-Residential Soil	0.87	1.00
SWMU 3							
NB11S2	Arsenic, total	mg/kg	5.00		RBC-Industrial Soil	3.82	1.30
NB11S2	Arsenic, total	mg/kg	5.00		RBC-Residential Soil	0.43	11.7
NB11S3	Arsenic, total	mg/kg	5.10		RBC-Industrial Soil	3.82	1.30
NB11S3	Arsenic, total	mg/kg	5.10		RBC-Residential Soil	0.43	12.0
NB11S4	Arsenic, total	mg/kg	2.30		RBC-Residential Soil	0.43	5.40
NB11S5	Arsenic, total	mg/kg	21.3		RBC-Industrial Soil	3.82	5.60
NB11S5	Arsenic, total	mg/kg	21.3		RBC-Residential Soil	0.43	50.0
NB11S2	Benzo(a)pyrene	mg/kg	0.91		RBC-Industrial Soil	0.78	1.20

Table 3-1
Surface Soil Exceedances
SWMU 2 and SWMU 3

Sample ID	Compound	Units	Value	Qualifier	Comparison Criteria	Criterion Value	Exceedance Quotient
NB11S2	Benzo(a)pyrene	mg/kg	0.91		RBC-Residential Soil	0.09	10.4
NB11S3	Benzo(a)pyrene	mg/kg	4.2		RBC-Industrial Soil	0.78	5.40
NB11S3	Benzo(a)pyrene	mg/kg	4.2		RBC-Residential Soil	0.09	48.0
NB11S4	Benzo(a)pyrene	mg/kg	0.26	J	RBC-Residential Soil	0.09	3.00
NB11S2	Benzo(a) anthracene	mg/kg	0.98		RBC-Residential Soil	0.87	1.10
NB11S3	Benzo(a) anthracene	mg/kg	4.30		RBC-Residential Soil	0.87	4.90
NB11S2	Benzo(b) fluoranthene	mg/kg	1.20		RBC-Residential Soil	0.87	1.40
NB11S3	Benzo(b) fluoranthene	mg/kg	5.00		RBC-Residential Soil	0.87	5.70
NB11S2	Dibenzo(a,h) anthracene	mg/kg	0.14	J	RBC-Residential Soil	0.09	1.60
NB11S3	Dibenzo(a,h) anthracene	mg/kg	0.41		RBC-Residential Soil	0.09	4.70
NB11S3	Indeno(1,2,3-cd) pyrene	mg/kg	2.30		RBC-Residential Soil	0.87	2.60

Notes:

J- Estimated Value

Exceedance Quotient = measured concentration/comparison criterion value

Subsurface Soil Screening Criteria Exceedances

One inorganic chemical, arsenic, was detected at concentrations exceeding the screening criteria (Table 3-2). All sample locations and screening criteria exceedances are shown in Figure 3-1. Arsenic was detected above the screening criteria at two of four sampling locations at SWMU 2. The arsenic levels detected were within the range of arsenic concentrations detected within a soil background investigation at NSN (CH2MHill, May 2000) At SWMU 3, only PAHs were detected above the screening criteria.

Table 3-2
Subsurface Soil Exceedances
SWMU 2 and SWMU 3

Sample ID	Compound	Units	Value	Qualifer	Comparison Criteria	Criterion Value	Exceedance Quotient
SWMU 2							
NB10D1	Arsenic, total	mg/kg	7.20		RBC-Industrial Soil	3.82	1.90
NB10D1	Arsenic, total	mg/kg	7.20		RBC-Residential Soil	0.43	16.9
NB10D2	Arsenic, total	mg/kg	10.8		RBC-Industrial Soil	3.82	2.80
NB10D2	Arsenic, total	mg/kg	10.8		RBC-Residential Soil	0.43	25.4
SWMU 3							
NB11D1	Benzo(a)pyrene	mg/kg	1.50		RBC-Industrial Soil	0.78	1.90
NB11D1	Benzo(a) pyrene	mg/kg	1.50		RBC-Residential Soil	0.09	3.00
NB11D1	Benzo(a) anthracene	mg/kg	1.30		RBC-Residential Soil	0.87	1.50
NB11D1	Benzo(b) fluoranthene	mg/kg	2.00		RBC-Residential Soil	0.87	2.30

Notes:

J- Estimated Value

Exceedance Quotient = measured concentration/comparison criterion value

Conclusions and Recommendations

As mentioned in the introduction, the results presented in Section 3 were produced from sampling activities which occurred in 1995 and 1996. Building Z-309 was renovated in 1997 under a Navy Public Works project. Approximately 2844 square feet of the building on the south side that housed two large boilers was demolished, including the associated concrete slab. In addition, the components of the Ash Hopper and Oil/Lube Storage Area were removed to below ground level. This included removal of the sludge in the ash trenching system, the blow down pit, paving, curb and gutter, and railroad ties. A new parking lot was provided in its place, and the remaining area was covered with topsoil and seeded. Therefore, both SMWUs 2 and 3 have been demolished and have received new backfill and paving.

On the basis of the available data, SWMU 2 and 3 do not present a threat to human health or the environment. Therefore, further evaluation or a streamlined risk assessment is not warranted, and these sites can be closed as NFA sites.

SWMU 40:
MCA – 603 Pits

SWMU 40
Section 1

Introduction

This SWMU Close-Out Report presents the results of the environmental sampling and analysis performed at SWMU 40 - MCA-603 Pits at the Naval Station, Norfolk (NSN), Norfolk, Virginia.

This report is organized into four sections. Section 1 describes the SWMU, discusses current land use and anticipated future land use for the area of the base that includes SWMU 40, and provides information regarding environmental investigations conducted at the SWMU. Details on the number of samples collected, collection techniques, sampling locations and dates, and sample analysis are provided in Section 2. Section 3 presents a qualitative human health and ecological risk characterization. Conclusions and recommendations are presented in Section 4.

Site Description

SWMU 40 is located east of 9th Street, between C and A Streets, in a grassy field. This area is presently in use as a recreational area and contains several baseball diamonds and a soccer field. The field was noted to contain two pits, one containing a liquid in the EPA document entitled *Aerial Photographic Site Analysis Norfolk Naval Base, Norfolk, Virginia* (September 1994). This pit area was designated Waste Disposal Area (WDA) 22 and is shown on Figure 17 of the EPA document.

The location of SWMU 40 is shown on Figure 1-1. The figure shows an expanded site boundary because there was no indication in the field of the exact locations of past disposal pits. The size of the former pits is not known, but their combined area is likely to have been significantly smaller than one-half acre.

According to the Naval Base Norfolk 2010 Land Use Plan, anticipated future land use of this site is for industrial and logistics facilities.

Previous Investigations

During the EPA review of aerial photographs from 1963, two pits were noted. These pits were designated WDA-22 in the EPA document entitled *Aerial Photographic Site Analysis, Norfolk Naval Base, Norfolk Virginia* (September 1994), and described as two pits with one containing liquid.

Sampling and analysis of the groundwater, surface soil, and subsurface soil were performed by CH2M HILL in July 1998, during the SWMU Supplemental Investigation (SI). The sampling locations and a description of the SWMU SI sampling activities are presented in Section 2.

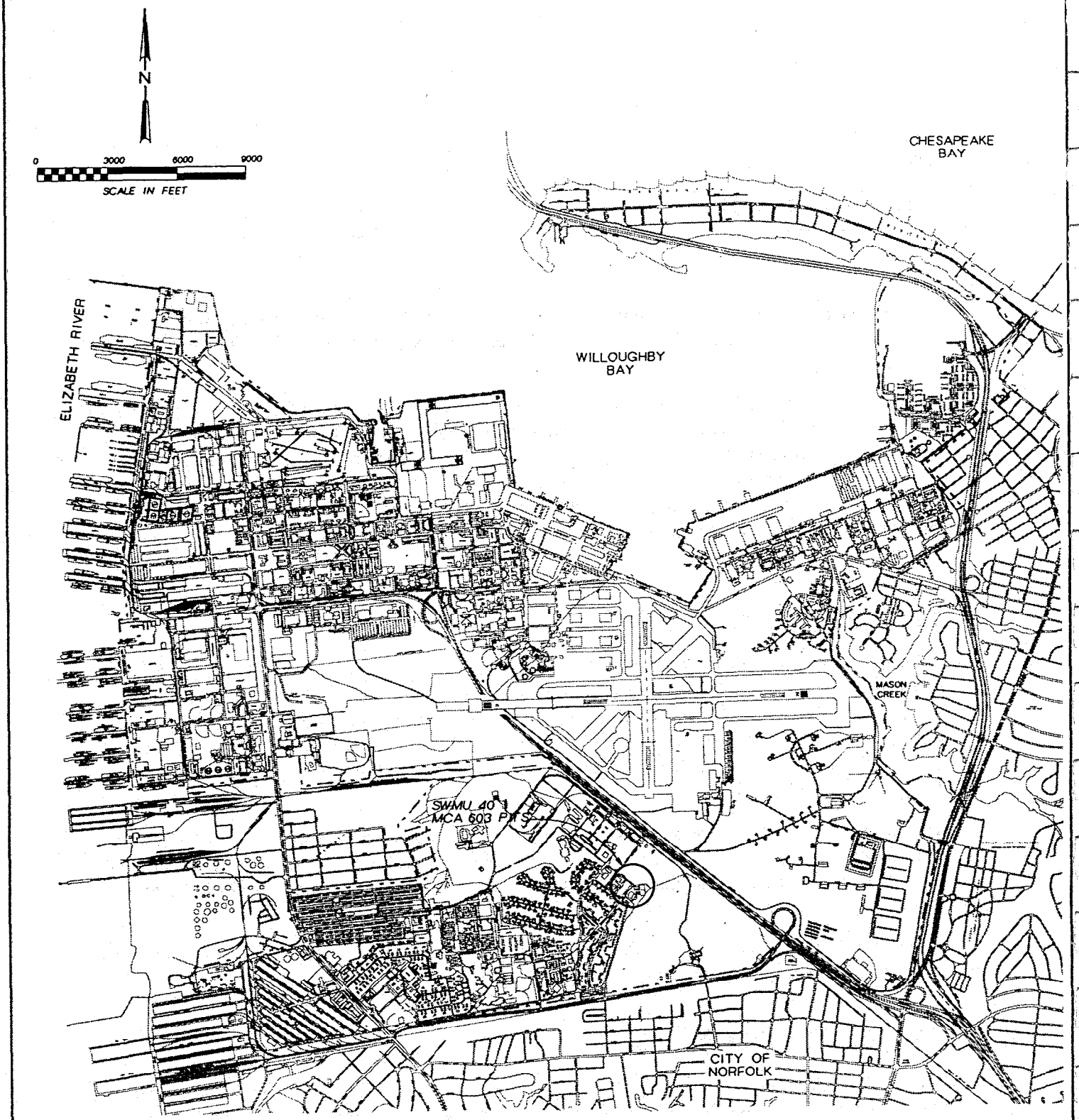

Figure 1-1
SWMU 40 - MCA-603 PITS
Naval Base, Norfolk

CH2MHILL

SWMU 40
Section 2

Field Activities

This section presents information related to the field activities associated with the sampling performed at SWMU 40. Details on the number of samples collected, collection techniques, sampling locations, and sample analysis are provided.

Supplemental Investigation Sampling Activities

Groundwater, subsurface soil, and surface soil samples were collected during the Supplemental Investigation sampling activities at SWMU 40. All groundwater samples were collected using the Geoprobe® direct-push sampling technology from a depth of approximately 10 to 20 feet below ground surface. The Geoprobe® direct-push sampling technology was also employed during subsurface soil sampling. Surface soil samples were collected using disposable trowels to transfer the soil directly in to the sample containers.

Four subsurface (DS01 through DS04) and four surface (SS01 through SS04) soil samples were collected from within the suspected pit area. Sampling was concentrated within the boundary of SWMU 40 to provide the most complete characterization of the soils in the area. All soil samples were analyzed for Target Compound List (TCL) VOCs, TCL SVOCs, TCL Pesticides and PCBs, and Target Analyte List (TAL) Inorganics.

Six groundwater samples were also collected during the investigation at SWMU 40. Four groundwater samples (DW03 through DW06) were collected at the same locations where subsurface and surface soil sampling were performed. The remaining two groundwater samples were collected near the assumed upgradient (DW02) and downgradient (DW01) boundary of SWMU 40 to determine the groundwater quality prior to entering and upon exiting the SWMU 40 area. The site and surrounding terrain is very flat, however, making it difficult to predict groundwater flow direction on the basis of topography or local drainage features. All groundwater samples were analyzed for TCL VOCs, TCL SVOCs, TCL Pesticides and PCBs, and TAL inorganics.

The field sampling activities associated with the supplemental investigation were performed during the week of July 13, 1998. The SWMU 40 sampling locations are shown on Figure 2-1.

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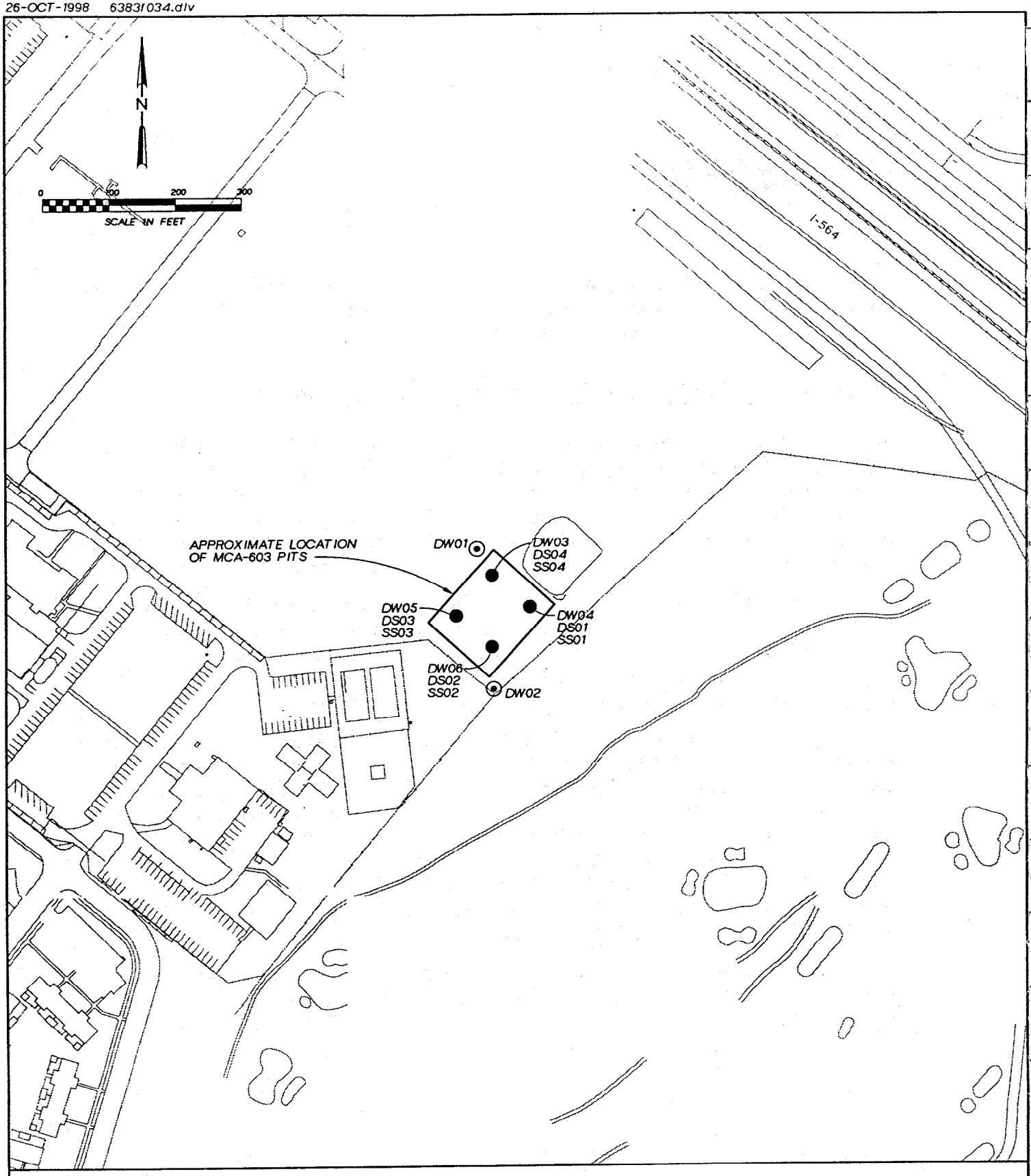

LEGEND

- ● GROUNDWATER, SUBSURFACE SOIL, AND SURFACE SOIL SAMPLING LOCATION
- ⊙ SI GEOPROBE GROUNDWATER SAMPLING LOCATION

Figure 2-1
SWMU 40 - MCA-603 PITS
SWMU INVESTIGATION
SAMPLING LOCATIONS
Naval Base, Norfolk

CH2MHILL

SWMU 40
Section 3

Risk Characterization

The following sections present the interpretation of the analytical data from the RRR Study and the SWMU Supplemental Investigation. The discussion includes the identification of screening/regulatory criteria exceedances, as well as exceedances of upgradient, background and offsite concentrations.

Analytical Results

The analytical results of the RRR Study and SWMU Supplemental Investigation are discussed as one combined data set in the following sections. Concentrations of detected chemicals were compared to the following current USEPA screening and regulatory screening criteria for each sample matrix: risk-based concentrations (RBCs) for residential and industrial soil, USEPA Region III tap water RBCs, and USEPA drinking water Maximum Contaminant Levels (MCLs) for groundwater. The USEPA Region III Biological Technical Assistance Group (BTAG) screening values were used for comparison only and were not used as FFA site classification or decision-making criteria.

Appendix A provides a compilation of the concentrations of all chemicals detected in samples collected during the Supplemental Investigation.

Groundwater

Six groundwater samples were collected at SWMU 40 during the Supplemental Investigation field activities. Table 3-1 lists the compounds that exceeded the tap water RBCs and/or the drinking water MCLs in the groundwater samples. Although groundwater flow direction is difficult to estimate because of the lack of topographic relief, groundwater is assumed to flow south to north, towards Willoughby Bay. This would make the groundwater sample NBW40-DW02 the upgradient sample.

Groundwater Screening and Regulatory Criteria Exceedances

No organic compound was detected at a concentration exceeding the screening or regulatory criteria (comparison criteria) in any groundwater sample. Two inorganic chemicals, antimony and thallium, were detected at concentrations exceeding the comparison criteria. Figure 3-1 presents the sampling locations with comparison criteria exceedances flagged. Table 3-2 presents the frequency of detection and the concentration detected at the upgradient sampling location for the compounds exceeding the comparison criteria.

The antimony concentration (258 µg/l) at sampling location DW01 exceeds the tap water RBC of 15 µg/l, the drinking water MCL of 6 µg/l, and the upgradient concentration of

4.3 µg/l. Thallium, detected at a concentration of 3.8 µg/l at DW04, was slightly higher than

Table 3-1
Groundwater Exceedances
SWMU 40

Sample ID	Compound	Units	Value	Qualifier	Comparison Criteria	Criterion Value	Exceedance Quotient
NBW40-DW01	Antimony	µg/l	258		MCL	6	43.00
NBW40-DW01	Antimony	µg/l	258		RBC Tap	15	17.67
NBW40-DW04	Thallium	µg/l	3.8	K	MCL	2	1. 90
NBW40-DW04	Thallium	µg/l	3.8	K	RBC Tap	2.56	1.49

Notes:

K – Biased high, actual concentrations may be lower than the reported value

Exceedance Quotient = measured concentration/criterion value
MCLs for analytes in table are as follows: Antimony – 6 ug/L
Thallium – 2 ug/L

Table 3-2
Frequency of Detection and Upgradient Concentration
SWMU 40 Groundwater

Frequency of Detection [1]	**Analyte**	**Units**	**Upgradient** [2] **DW02**
1 of 6	Thallium	µg/l	2.00
5 of 6	Antimony	µg/l	4.3

Notes:

[1] – Frequency of detection from all samples collected at SWMU

[2] – Assumed upgradient based on topographic position and local surface water features.

the tap water RBC of 2.56 µg/l, the MCL of 2 µg/l, and the upgradient concentration of 2 µg/l. However, neither antimony or thallium were found at elevated levels in soil samples, and there is no indication that their presence in groundwater is site related.

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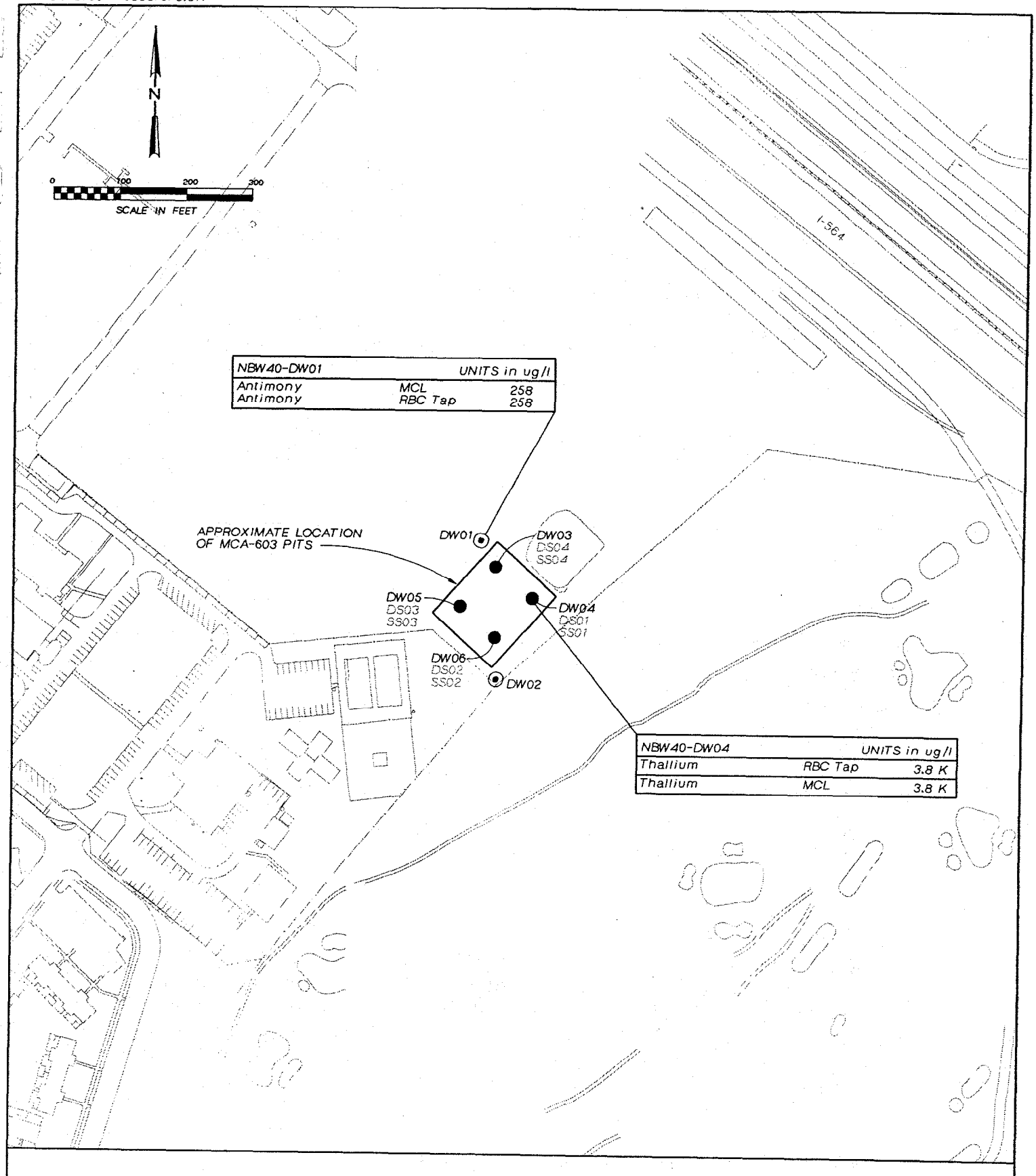


LEGEND

- ● GROUNDWATER, SUBSURFACE SOIL, AND SURFACE SOIL SAMPLING LOCATION
- ⊙ SI GEOPROBE GROUNDWATER SAMPLING LOCATION

QUALIFIERS

K- Biased high, actual concentrations may be lower

Figure 3-1
SWMU 40 - MCA-603 PITS
GROUNDWATER EXCEEDANCES
Naval Base, Norfolk

CH2MHILL

Soil

Four surface and four subsurface soil samples were collected during the Supplemental Investigation field activities at SWMU 40. Chemicals detected at concentrations that exceeded the residential and/or industrial RBCs are listed in Table 3-3 and 3-4.

Surface Soil Screening Criteria Exceedances

No organic compound was detected at a concentration exceeding the screening criteria in any soil sample. One inorganic chemical, arsenic, was detected at concentrations exceeding the screening criteria. All sampling locations and screening criteria exceedances are shown on Figure 3-2.

Arsenic was detected at all sampling locations. The arsenic concentrations ranged from 0.81 mg/kg to 2.2 mg/kg, with all concentrations exceeding the residential RBC of 0.43 mg/kg.

Table 3-3
Surface Soil Exceedances
SWMU 40

Sample ID	Compound	Units	Value	Qualifier	Comparison Criteria	Criterion Value	Exceedance Quotient
NBW40-SS01	Arsenic, total	mg/kg	2.2	J	RBC-Residential Soil	0.43	5.17
NBW40-SS02	Arsenic, total	mg/kg	0.81	J	RBC-Residential Soil	0.43	1.90
NBW40-SS02P	Arsenic, total	mg/kg	2.1		RBC-Residential Soil	0.43	4.93
NBW40-SS03	Arsenic, total	mg/kg	1.7		RBC-Residential Soil	0.43	3.99
NBW40-SS04	Arsenic, total	mg/kg	1.2	J	RBC-Residential Soil	0.43	2.82

Notes:

J- Estimated Value

Exceedance Quotient = measured concentration/comparison criterion value

Background Considerations

Background concentration data provide important information for risk management decisions. The Navy has recently initiated a study to establish basewide background concentrations (CH2MHill, May 2000). The results of this study revealed that arsenic concentrations detected within the soils ranged from 1.3 to 42.2 mg/kg. As a result, the surface soil exceedance concentrations for arsenic were within the range of concentrations from background samples.

Subsurface Soil Screening Criteria Exceedances

One inorganic chemical, arsenic, was detected at concentrations exceeding the screening criteria (Table 3-4). All sampling locations and screening criteria exceedances are shown on Figure 3-2. . The arsenic concentrations ranged from 0.95 mg/kg to 2 mg/kg, with all concentrations exceeding the residential RBC of 0.43 mg/kg.

The subsurface soil exceedance concentrations for arsenic were below the highest arsenic concentration (42.2 mg/kg) from background samples (CH2MHill, May 2000).

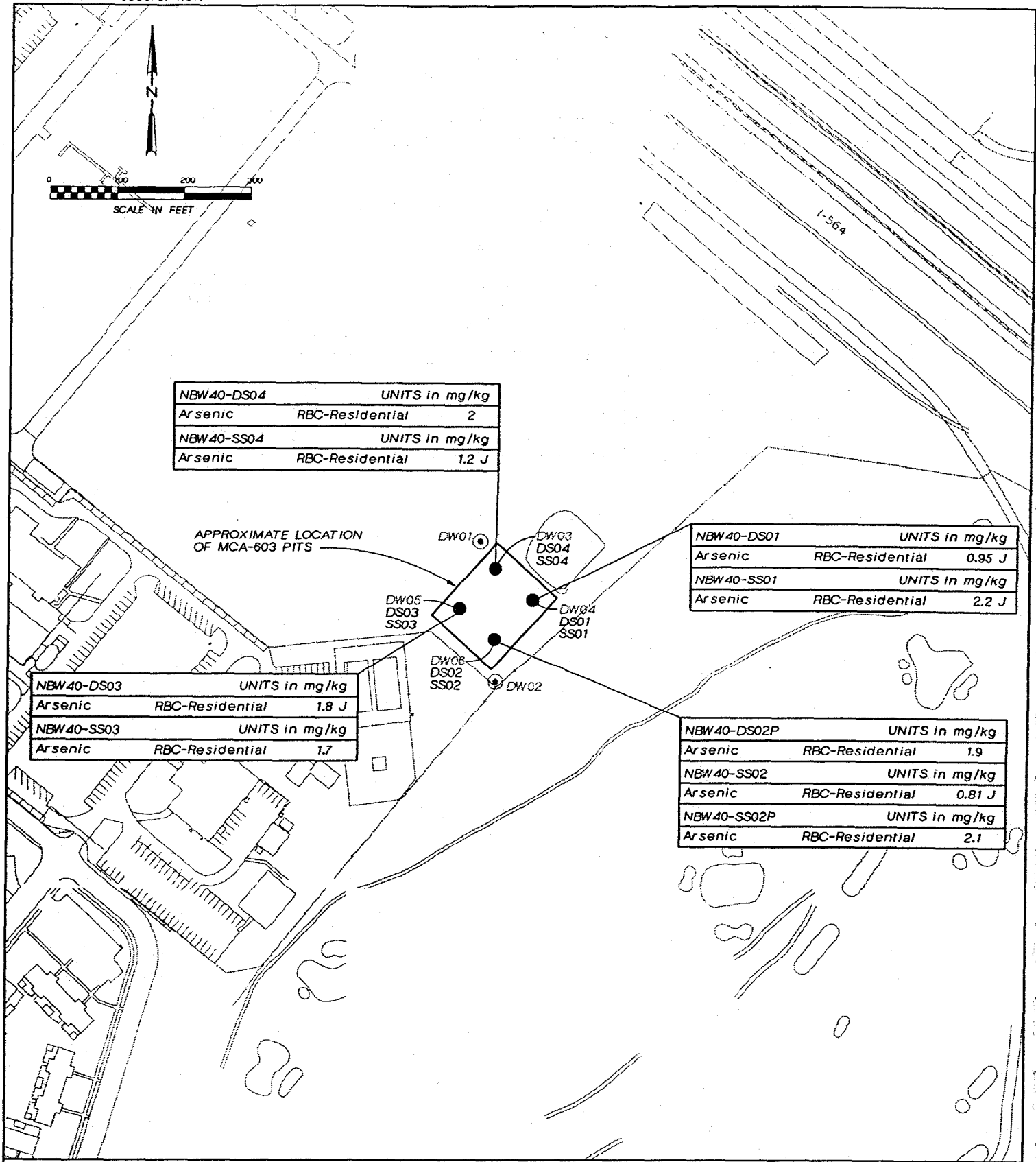
Table 3-4
Subsurface Soil Exceedances
SWMU 40

Sample ID	Compound	Units	Value	Qualifer	Comparison Criteria	Criterion Value	Exceedance Quotient
NBW40-DS01	Arsenic, total	Mg/kg	0.95	J	RBC-Residential Soil	0.43	2.23
NBW40-DS02P	Arsenic, total	Mg/kg	1.9		RBC-Residential Soil	0.43	4.46
NBW40-DS03	Arsenic, total	Mg/kg	1.8	J	RBC-Residential Soil	0.43	4.23
NBW40-DS04	Arsenic, total	Mg/kg	2		RBC-Residential Soil	0.43	4.70

Notes:

J- Estimated Value

Exceedance Quotient = measured concentration/comparison criterion value



LEGEND

- ● GROUNDWATER, SUBSURFACE SOIL, AND SURFACE SOIL SAMPLING LOCATION
- ⊙ SI GEOPROBE GROUNDWATER SAMPLING LOCATION

QUALIFIERS
J- Estimated value

Figure 3-2
SWMU 40 - MCA-603 PITS
SOIL EXCEEDANCES
Naval Base, Norfolk

CH2MHILL

SWMU 40
Section 4

Conclusions and Recommendations

Groundwater

As noted in the Introduction section preceding the close-out reports, the results of groundwater sampling did not factor significantly into the NFA evaluations. The groundwater samples were collected using direct-push technology. Groundwater samples collected using direct-push technology may not reliably represent actual groundwater conditions, and therefore are not used for quantitative risk assessment or risk management decision-making. The samples were used to make an initial evaluation of groundwater quality relative to the comparison criteria, and to see if any contaminants found at elevated concentrations in soils were also elevated in groundwater.

Antimony was detected at a concentration significantly higher than the drinking water MCL and upgradient concentration at one location. In addition, antimony also exceeded the tap water RBC. Thallium was also detected at a concentration that exceeded the tap water RBC and the drinking water MCL. However, the concentration was only slightly higher than the upgradient concentration, suggesting that the concentration may not be site related. Neither thallium nor arsenic was measured at elevated concentrations in soils.

Despite the above detections, concern over potential groundwater impacts of SWMU 40 is mitigated because the City of Norfolk supplies all potable water to the City and to Naval Station, Norfolk, and there are no potable water supply wells at NSN.

Surface Soil

Arsenic was detected at concentrations only slightly higher than the residential RBC but below background concentrations, suggesting that the exceedances may not be site related.

Subsurface Soil

Arsenic was detected at concentrations only slightly higher than the residential RBC but below background concentrations, suggesting that the exceedances may not be site related.

Recommendation

On the basis of the available data, SWMU 40 does not present a threat to human health or the environment. Therefore, further evaluation or a streamlined risk assessment is not warranted, and the site can be closed as an NFA site.

SWMU 41:
CA-99 Golf Course

SWMU 41
Section 1

Introduction

This SWMU Close-Out Report presents the results of environmental sampling and analysis performed at SWMU 41 - Probable Disposal Area, CA-99 Golf Course at the Naval Station, Norfolk (NSN) Norfolk, Virginia. This report is organized into four sections. Section 1 describes the SWMU, discusses current land use and anticipated future land use for the area of the base that includes SWMU 41, and provides information regarding environmental investigations conducted at the SWMU. Details on the number of samples collected, collection techniques, sampling locations and dates, and sample analysis are provided in Section 2. Section 3 presents a qualitative human health and ecological risk characterization. Conclusions and recommendations are presented in Section 4.

Site Description

SWMU 41 is located immediately west of the I-564 / Terminal Boulevard interchange, next to the CA-99 golf course. The area presently contains a pond with recreational facilities. This area was noted to contain disturbed ground attributed to possible disposal activities in the EPA document entitled *Aerial Photographic Site Analysis Norfolk Naval Base, Norfolk, Virginia* (September 1994). This area was designated as WDA-23 and is shown on Figure 17 of the EPA document. The site is bounded by I-564, a large electrical substation, and the golf course, and the site would not be suitable for residential land use. The location of SWMU 41 is shown on Figure 1-1.

According to the Naval Base Norfolk 2010 Land Use Plan, the anticipated future use for this area of the base is for industrial and logistics facilities.

Previous Investigations

During the EPA review of aerial photographs from 1968, 1987, and 1990, areas of disturbed ground in suspected disposal areas were noted. The suspected disposal areas were designated as WDA-23 in the EPA document entitled *Aerial Photographic Site Analysis, Norfolk Naval Base, Norfolk Virginia* (September 1994), and described as disturbed ground with possible disposal (1968 and 1987 photo) and disturbed ground (1990 photo).

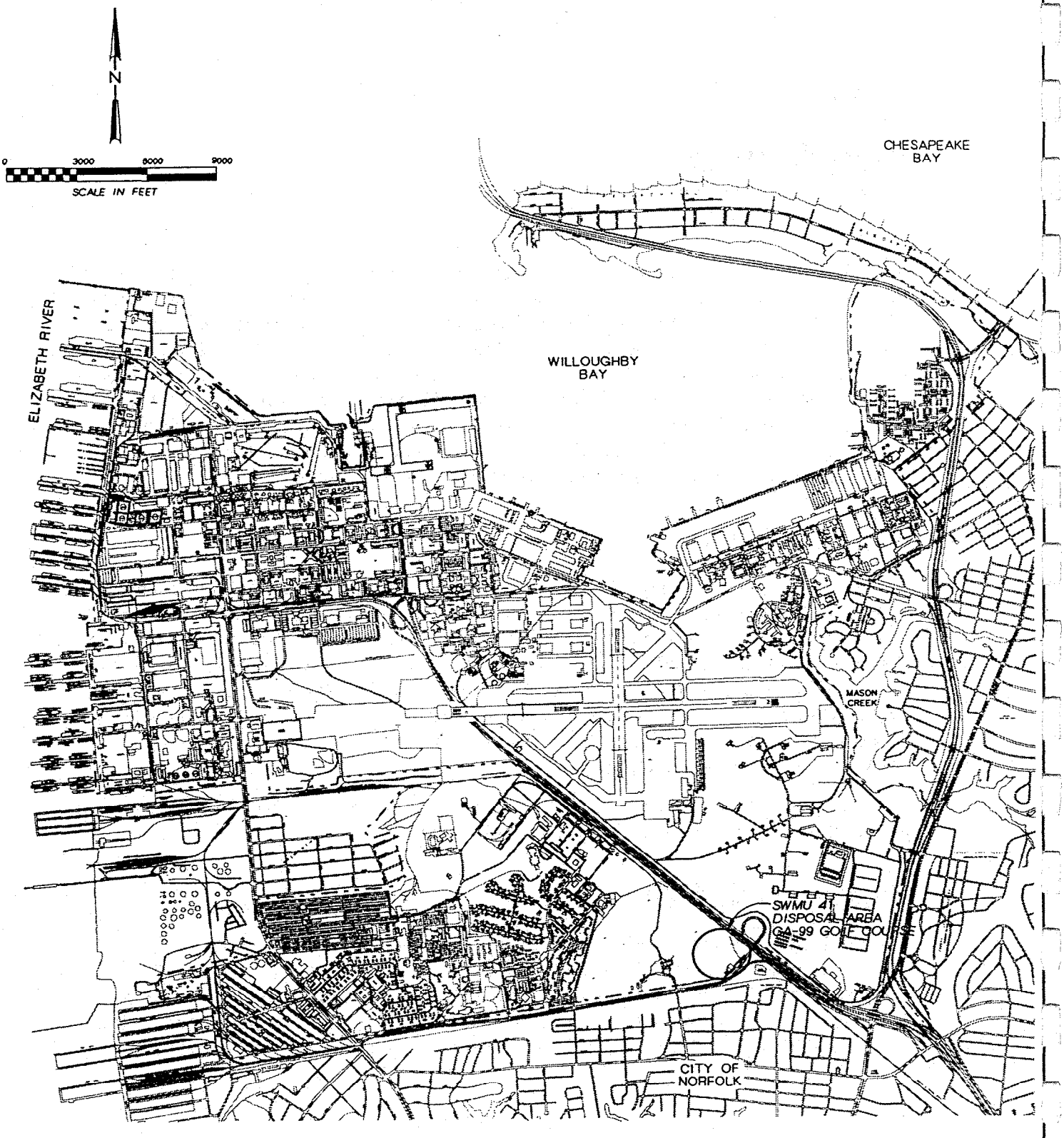


Figure 1-1
SWMU 41 - DISPOSAL AREA,
CA-99 GOLF COURSE
Naval Base, Norfolk

CH2MHILL

SWMU 41
Section 2

Field Activities

This section presents the results of the Supplemental Investigation at SWMU 41. Included in the discussion is the RRR Study sampling details and the SWMU Supplemental Investigation sampling details. Details on the number of samples collected, collection techniques, sampling locations, and sample analysis are provided.

Previous Sampling Activities

No information was available on previous sampling activities.

Supplemental Investigation Sampling Activities

Groundwater and surface soil samples were collected during the Supplemental Investigation sampling activities at SWMU 41. All groundwater samples were collected using the Geoprobe® direct-push sampling technology from a depth of approximately 10 to 20 feet below ground surface. Surface soil samples were collected using disposable trowels to transfer the soil directly in to the sample containers.

Three surface soil samples (SS01 through SS03) were collected from the area of bermed soil located adjacent to Terminal Boulevard and I-564 to determine if the bermed soil is construction-related or related to disposal activities at this SWMU. All soil samples were analyzed for Target Compound List (TCL) Volatile Organic Compounds (VOCs), TCL Semivolatile Organic Compounds (SVOCs), TCL Pesticides and PCBs, and Target Analyte List (TAL) Inorganics.

Three groundwater samples (DW01 through DW03) were collected between the area of bermed soil and the pond located at the SWMU. These groundwater samples were collected downgradient of the possible disposal area, within 10 feet of the pond bank. Groundwater samples were analyzed for TCL VOCs, TCL SVOCs, TCL Pesticides and PCBs, and TAL Inorganics.

The field sampling activities associated with the supplemental investigation were performed during the week of July 13, 1998. The SWMU 41 sampling locations are shown on Figure 2-1.

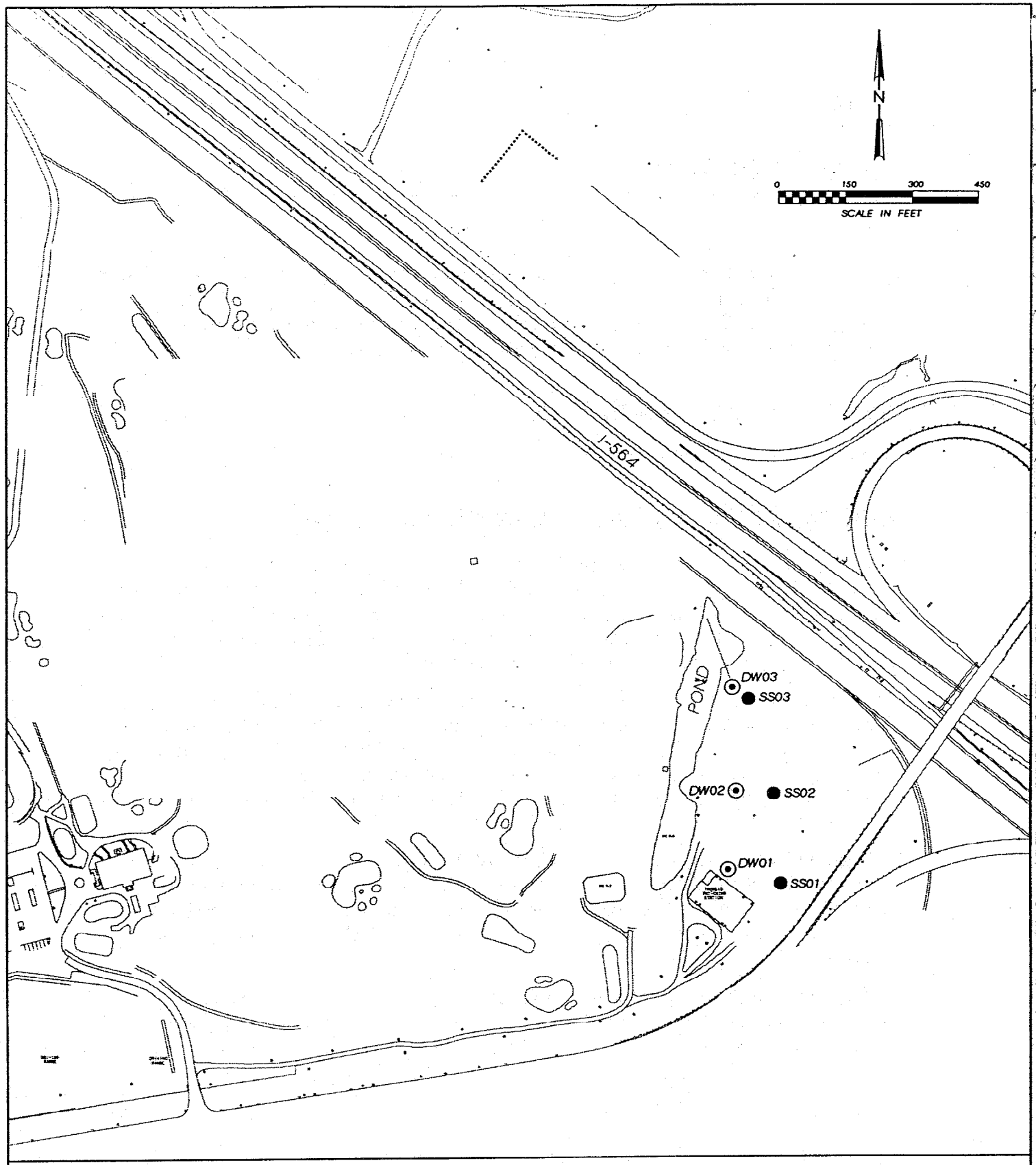


Figure 2-1
SWMU 41 - DISPOSAL AREA,
CA-99 GOLF COURSE
SWMU INVESTIGATION
SAMPLING LOCATIONS
Naval Base, Norfolk

LEGEND

- ● SI SURFACE SOIL SAMPLING LOCATION
- ⊙ SI GEOPROBE GROUNDWATER SAMPLING LOCATION

CH2MHILL

SWMU 41
Section 3

Risk Characterization

The following sections present the interpretation of the analytical data from the RRR Study and the SWMU Supplemental Investigation. The discussion includes the identification of screening/regulatory criteria exceedances, as well as exceedances of upgradient, background, and offsite concentrations.

Analytical Results

The analytical results of the RRR Study and SWMU Supplemental Investigation are discussed as one combined data set in the following sections. Concentrations of detected chemicals were compared to the following current USEPA screening and regulatory screening criteria for each sample matrix: risk-based concentrations (RBCs) for residential and industrial soil, USEPA Region III tap water RBCs, and USEPA drinking water Maximum Contaminant Levels (MCLs) for groundwater. The USEPA Region III Biological Technical Assistance Group (BTAG) screening values were used for comparison only and were not used as FFA site classification or decision-making criteria.

Appendix A provides a compilation of the concentrations of all chemicals detected in samples collected during the Supplemental Investigation.

Groundwater

Three groundwater samples were collected at SWMU 41 during the Supplemental Investigation field activities. Table 3-1 lists the compounds that exceeded the tap water RBCs and/or the drinking water MCLs in the groundwater samples. Groundwater at this SWMU was estimated to flow southwest to northeast, towards the pond and Willoughby Bay. The assumed upgradient groundwater sample at SWMU 41 was collected at NBW41-DW01.

Groundwater Screening and Regulatory Criteria Exceedances

No organic compound was detected at a concentration exceeding the screening or regulatory criteria (comparison criteria) in any groundwater sample. One inorganic chemical, manganese, was detected at concentrations exceeding the comparison criteria. Figure 3-1 presents the sampling locations with comparison criteria exceedances flagged. Table 3-2 presents the frequency of detection and the concentration detected at the upgradient sampling location for the compounds exceeding the comparison criteria.

Manganese was detected at DW02 at concentration of 1,970 µg/l. This exceeds the tap water RBC of 730 µg/l, the secondary MCL of 50 µg/l, and assumed upgradient DW01 concentration of 682 µg/l. Manganese was also detected at DW02 at a concentration of 813 µg/l, only slightly higher than the tap water RBC and upgradient concentration.

Table 3-1
Groundwater Exceedances
SWMU 41

Sample ID	Compound	Units	Value	Qualifier	Comparison Criteria	Criterion Value	Exceedance Quotient
NBW41-DW02	Manganese	µg/l	1970		RBC Tap	730	2.70
NBW41-DW03	Manganese	µg/l	813		RBC Tap	730	1.11

Exceedance Quotient = measured concentration/ criterion value
Secondary MCL for manganese is 50 ug/L. Secondary drinking water standards are unenforceable federal guidelines.

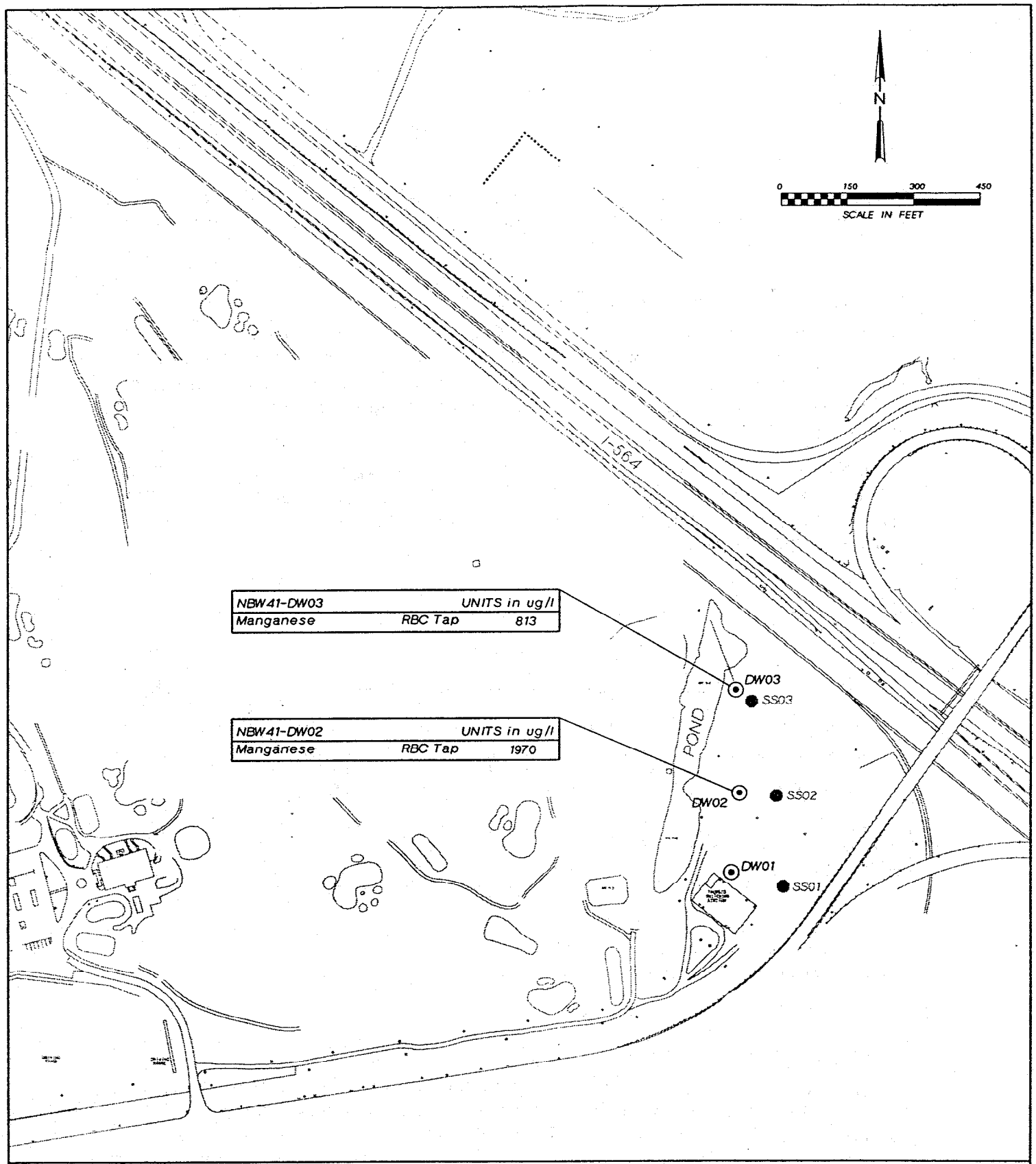
Table 3-2
Frequency of Detection and Upgradient Concentration
SWMU 41 Groundwater

Frequency of Detection [1]	**Analyte**	**Units**	**Upgradient** [2] **DW01**
3 of 3	Manganese	µg/l	682.

Notes:

[1] – Frequency of detection from all samples collected at SWMU

[2] – Assumed upgradient based on topographic position and local surface water features.



LEGEND

- SI SURFACE SOIL SAMPLING LOCATION
- SI GEOPROBE GROUNDWATER SAMPLING LOCATION

Figure 3-1
SWMU 41 - DISPOSAL AREA,
CA-99 GOLF COURSE
GROUNDWATER EXCEEDANCES
Naval Base, Norfolk

CH2MHILL

Soil

Three surface soil samples were collected during the supplemental investigation. Chemicals detected at concentrations that exceeded the residential and/or industrial RBCs are listed in Table 3-3.

Surface Soil Screening Criteria Exceedances

One polynuclear aromatic hydrocarbon (PAH), benzo(a)pyrene, exceeded the screening criteria. No other organic compound was detected above the screening criteria in any soil samples. One inorganic chemical, arsenic, was detected at concentrations exceeding the screening criteria in all samples. All sampling locations and screening criteria exceedances are shown on Figure 3-2.

Benzo(a)pyrene was detected at a concentration of 240 µg/kg at SS01, which exceeds the residential RBC of 87.5 µg/kg. Arsenic was detected at all sampling locations with concentrations ranging from 1.7 mg/kg to 3.2 mg/kg. All arsenic detections exceeded the residential RBC of 0.43 mg/kg.

Table 3-3
Surface Soil Exceedances
SWMU 41

Sample ID	Compound	Units	Value	Qualifer	Comparison Criteria	Criterion Value	Exceedance Quotient
NBW41-SS01	Benzo(a)pyrene	µg/kg	240	J	RBC-Residential Soil	87	2.74
NBW41-SS01	Arsenic, total	mg/kg	1.7	K	RBC-Residential Soil	0.43	3.99
NBW41-SS02	Arsenic, total	mg/kg	3	K	RBC-Residential Soil	0.43	7.05
NBW41-SS03	Arsenic, total	mg/kg	2.9	K	RBC-Residential Soil	0.43	6.81
NBW41-SS03P	Arsenic, total	mg/kg	3.2	K	RBC-Residential Soil	0.43	7.51

Notes:

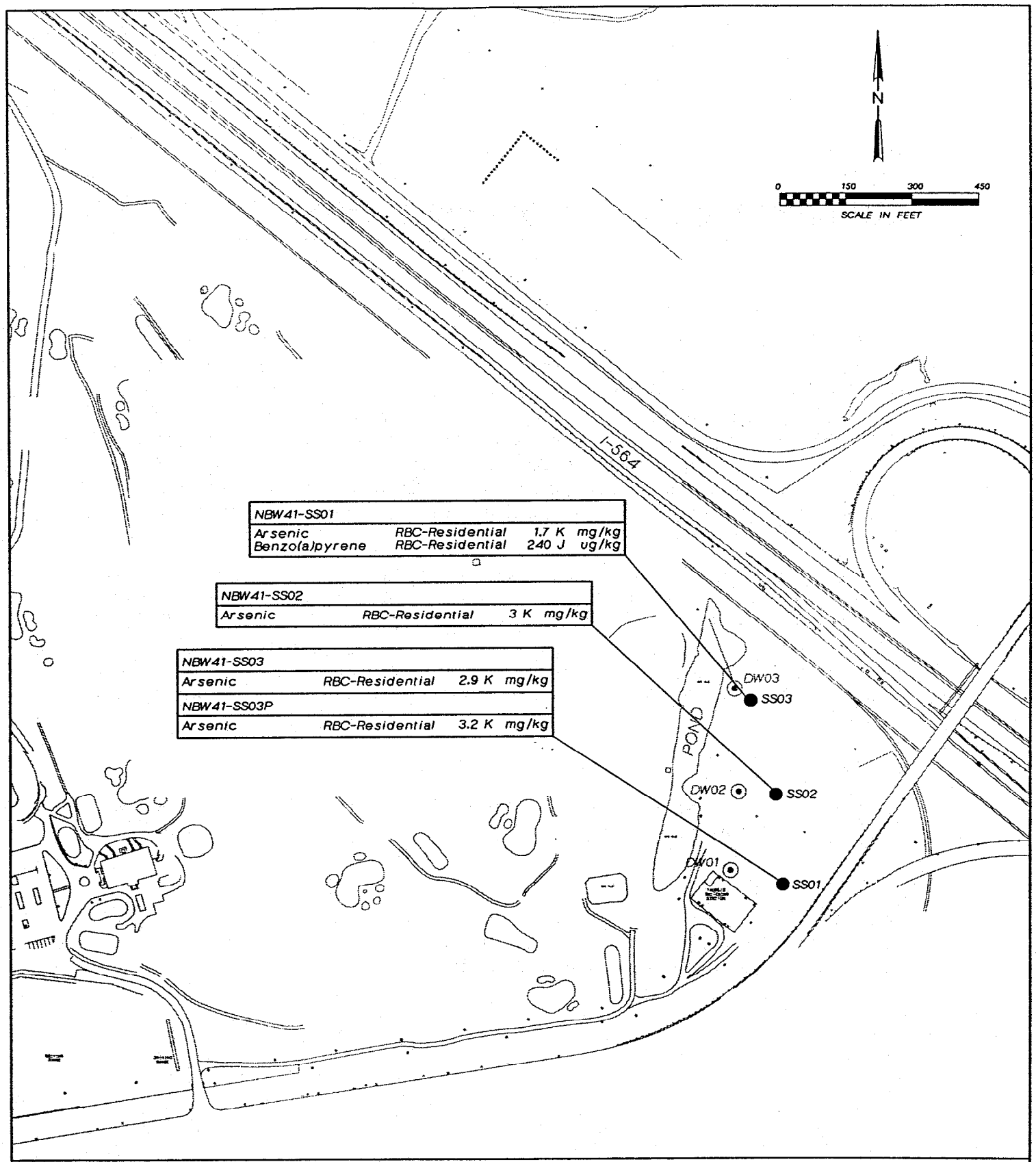
J- Estimated Value

K – Biased high, actual concentrations may be lower than the reported value

Exceedance Quotient = measured concentration/ criterion value

Background Considerations

Background concentration data provide important information for risk management decisions. The Navy has recently initiated a study to establish basewide background concentrations (CH2MHill, May 2000). The results of this study revealed that arsenic concentrations detected within the soils ranged from 1.3 to 42.2 mg/kg. The benzo(a)pyrene concentrations in the background study ranged from non-detectable to 440 ug/kg. As a result, the surface soil exceedance concentrations for arsenic were within the range of concentrations from background samples.



LEGEND

- SI SURFACE SOIL SAMPLING LOCATION
- SI GEOPROBE GROUNDWATER SAMPLING LOCATION

QUALIFIERS

J- Estimated value

K- Biased high, actual concentrations may be lower

Figure 3-2
SWMU 41 - DISPOSAL AREA,
CA-99 GOLF COURSE
SOIL EXCEEDANCES
Naval Base, Norfolk

CH2MHILL

SWMU 41
Section 4

Conclusions and Recommendations

Groundwater

As noted in the introduction for this set of close-out reports, the results of groundwater sampling did not factor significantly into the NFA evaluations. The groundwater samples were collected using direct-push technology. Groundwater samples collected using direct-push technology may not reliably represent actual groundwater conditions, and are not used for quantitative risk assessment or risk management decisions. The samples were used to make an initial evaluation of groundwater quality relative to the comparison criteria, and to see if any contaminants found at elevated concentrations in soils were also elevated in groundwater.

Manganese was detected at a concentration significantly higher than the tap water RBC and the upgradient concentration. Manganese is a naturally occurring substance in soils, and is an essential micronutrient for plant growth that is typically found in commercial fertilizers. It is expected that either the natural soil or applied fertilizers could explain the elevated levels of manganese in groundwater. In addition, the City of Norfolk supplies all potable water to the City and to Naval Station Norfolk, and there are no potable water supply wells at NSN.

Surface Soil

Arsenic and benzo(a)pyrene were detected above the residential RBC, but both arsenic and benzo(a)pyrene were detected at higher concentrations in the background soils at NSN.

Recommendation

On the basis of the available data, SWMU 41 does not present a threat to human health or the environment. Therefore, further evaluation or a streamlined risk assessment is not warranted, and the site can be closed as an NFA site.

SWMU 42:
Building Z-309 Ash Hopper Area

SWMU 42
Section 1

Introduction

This SWMU Close-Out Report presents the results of the environmental sampling and analysis performed at SWMU 42 - CEP-201 Compound at the Naval Station, Norfolk (NSN) Norfolk, Virginia.

This report is organized into four sections. Section 1 describes the SWMU, describes current land use and anticipated future land use for the area of the base that includes SWMU 42, and provides information regarding environmental investigations conducted at the SWMU. Details on the number of samples collected, collection techniques, sampling locations and dates, and sample analysis are provided in Section 2. Section 3 presents a qualitative human health and ecological risk characterization. Conclusions and recommendations are presented in Section 4.

Site Description

The site encompasses the entire area surrounding Building CEP-201. The area is an industrial setting, and is entirely covered with asphalt except for a five-foot wide grass area that extends through the center of the site. Underground electrical lines which service overhead light poles are located within this grassy area. The area serves as a storage facility for large objects or equipment awaiting shipment. Tractor-trailers are also kept in the area until they are needed for material transport. The location of SWMU 42 is shown on Figure 1-1.

According to the Naval Base Norfolk 2010 Land Use Plan, the anticipated future land use for this area of the base is for industrial and logistics facilities.

Previous Investigations

During the EPA review of aerial photographs from 1949 and 1958, mounded materials in suspected disposal areas were noted. The suspected disposal areas were designated as WDA-9 and WDA-10 in the EPA document entitled *Aerial Photographic Site Analysis, Norfolk Naval Base, Norfolk Virginia* (September 1994), and described as a disposal area with large pile of multi-toned material (1949 photo, WDA-9) and a possible disposal area (1958 photo, WDA-10).

Sampling and analysis of the subsurface soil were performed in September 1996 during the Phase II Relative Risk Ranking (RRR) Study. The sampling locations and a description of the RRR Study sampling activities are presented in Section 2.

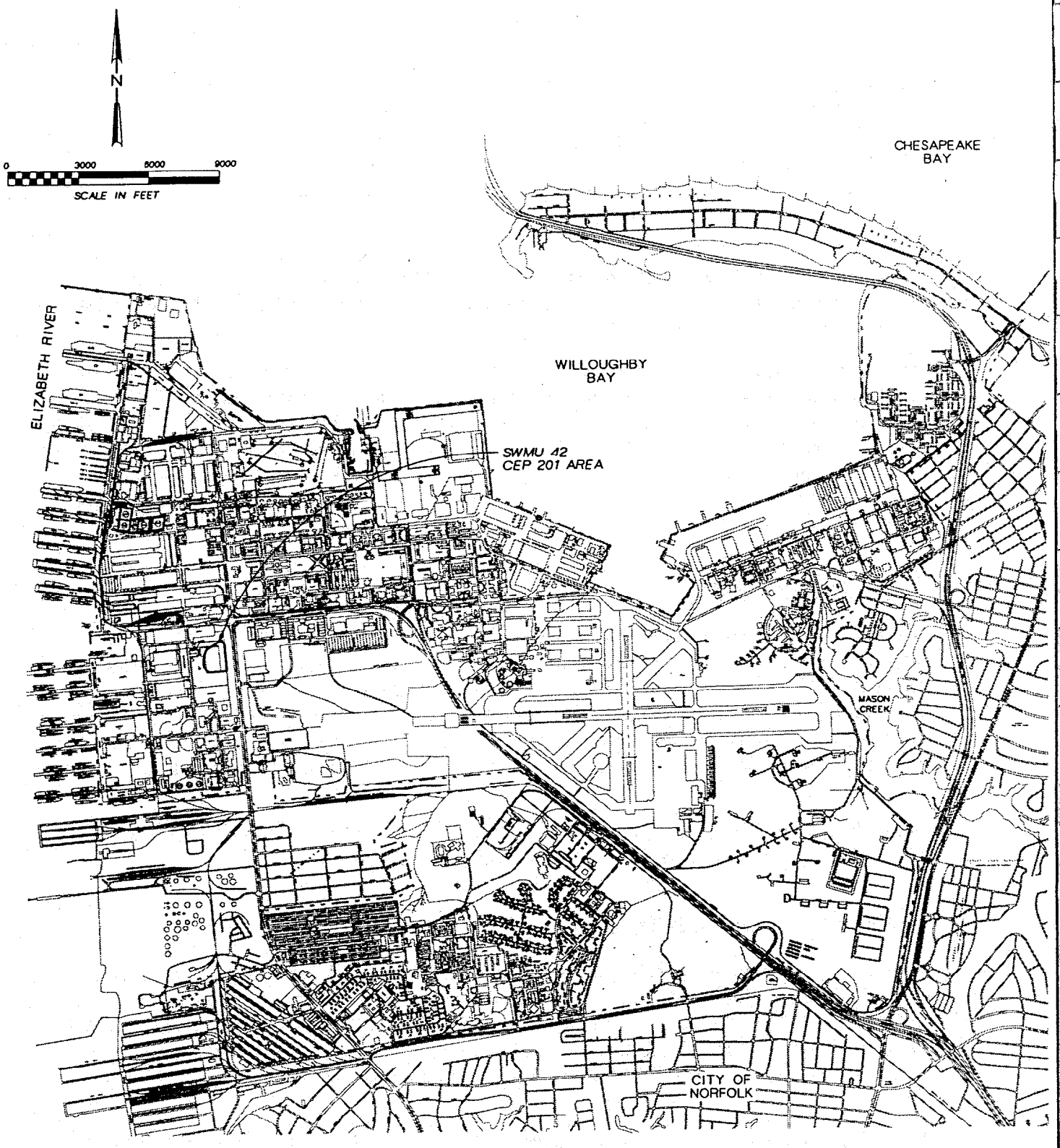


Figure 1-1
SWMU 42 - CEP 201 AREA
Naval Base, Norfolk

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SWMU 42
Section 2

Field Activities

This section presents the results of the Supplemental Investigation at SWMU 42. Included in the discussion are the sampling details of the RRR Study and the SWMU Supplemental Investigation.

Previous Sampling Activities

Two subsurface soil samples were collected and analyzed for Volatile Organic Compounds (VOCs), Semivolatile Organic Compounds (SVOCs), Pesticides and PCBs, and inorganics at SWMU 42 during the Phase II RRR Study. Figure 2-1 shows the RRR sampling locations at SWMU 42.

Supplemental Investigation Sampling Activities

Groundwater samples were collected during the Supplemental Investigation sampling activities at SWMU 42. All groundwater samples were collected using the Geoprobe® direct-push sampling technology from a depth of approximately 10 to 20 feet below ground surface.

Two groundwater samples (DW04 and DW05) were collected beneath the asphalt on the western (assumed downgradient) side of Building CEP-201. These samples were collected from the area between the concrete tractor-trailer storage pad and the loading bays on the western side of Building CEP-201. The remaining three samples (DW01 through DW03) were collected from assumed upgradient locations on the Hampton Boulevard side of the fence line that defines the eastern boundary of NBN. All groundwater samples were analyzed for Target Compound List (TCL) VOCs, TCL SVOCs, TCL Pesticides and PCBs, and Target Analyte List (TAL) inorganics.

The field sampling activities associated with the supplemental investigation were performed during the week of July 13, 1998. The sampling locations at SWMU 42 are shown on Figure 2-1.

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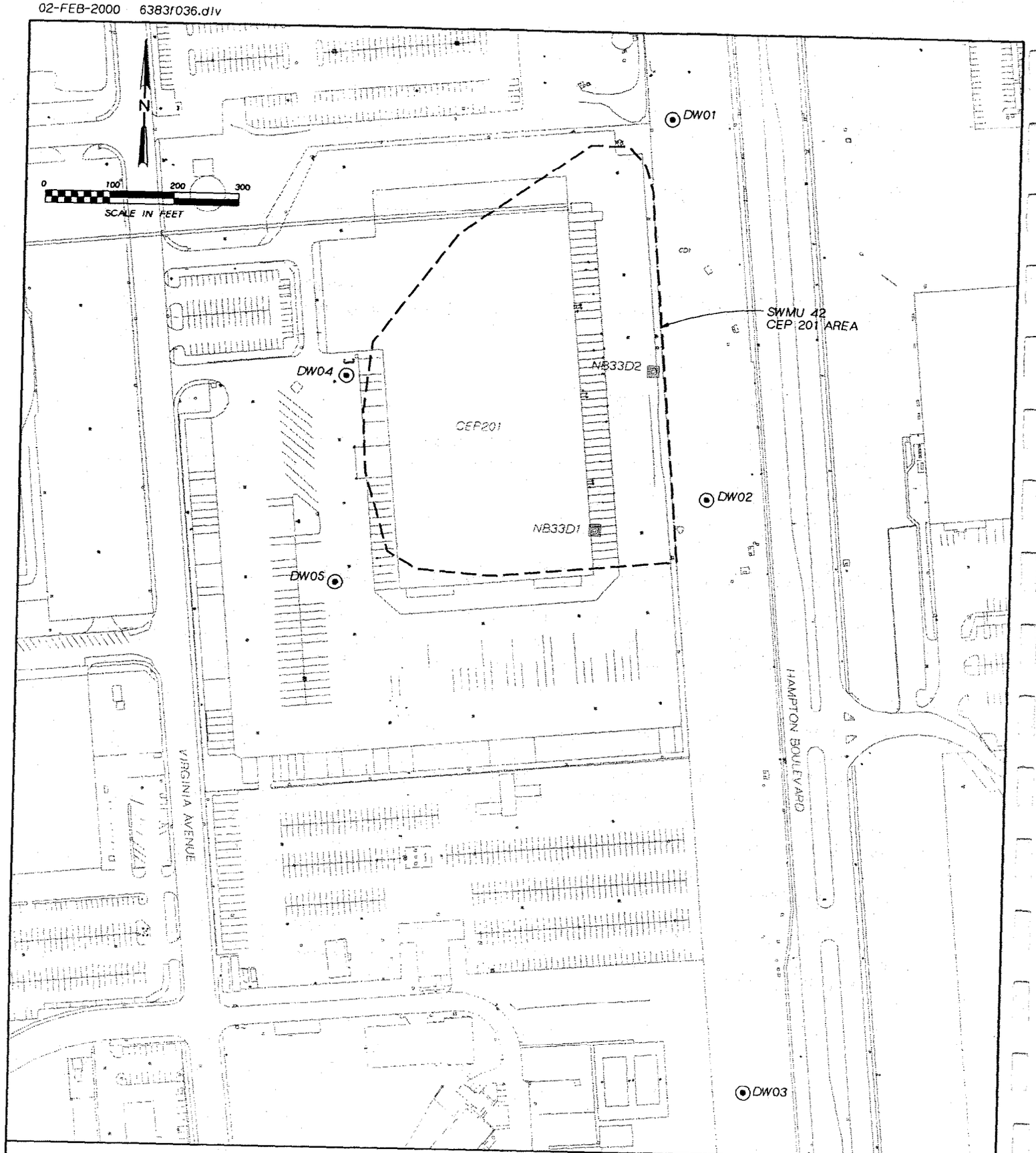

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NB33D1 — PHASE I RRR SUBSURFACE SOIL SAMPLE LOCATION

SI GEOPROBE GROUNDWATER SAMPLING LOCATION

ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT

Figure 2-1
SWMU 42 - CEP 201 AREA
SAMPLING LOCATION
Naval Base, Norfolk

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SWMU 42
Section 3

Risk Characterization

The following sections present the interpretation of the analytical data from the RRR Study and the SWMU Supplemental Investigation. The discussion includes the identification of screening/regulatory criteria exceedances, as well as exceedances of upgradient, background, and offsite concentrations for the individual media sampled.

Analytical Results

The analytical results of the RRR Study and SWMU Supplemental Investigation are discussed as one combined data set in the following sections. Concentrations of detected chemicals were compared to the following current USEPA comparison screening criteria for each sample matrix: risk-based concentrations (RBCs) for residential and industrial soil, USEPA Region III tap water RBCs, and USEPA drinking water Maximum Contaminant Levels (MCLs) for groundwater. The USEPA Region III Biological Technical Assistance Group (BTAG) screening values were used for comparison only and not for FFA site classification or decision-making criteria.

Appendix A provides a compilation of the concentrations of all chemicals detected in samples collected during the Supplemental Investigation.

Groundwater

Five groundwater samples were collected at SWMU 42 during the Supplemental Investigation field activities. Table 3-1 lists the compounds that exceeded the tap water RBCs and/or the drinking water MCLs in the groundwater samples. Groundwater at this SWMU was estimated to flow east to west, towards the Elizabeth River. Of the three assumed upgradient groundwater samples at SWMU 42, NBW42-DW03 seemed least impacted by industrial activities in the vicinity of the site.

Groundwater Screening and Regulatory Criteria Exceedances

No organic compound was detected at a concentration exceeding the screening or regulatory criteria (comparison criteria) in any groundwater sample. Four inorganic chemicals - iron, thallium, arsenic, and manganese - were detected at concentrations exceeding the comparison criteria. Figure 3-1 presents the sampling locations with comparison criteria exceedances flagged. Table 3-2 presents the frequency of detection and the concentration detected at DW03, the upgradient sampling location for the compounds exceeding the comparison criteria, which is considered most likely to be unaffected by the site.

Arsenic, iron, manganese, and thallium were detected at concentrations that exceeded the tap water RBC in at least one sample.

Table 3-1
Groundwater Exceedances
SWMU 42

Sample ID	Compound	Units	Value	Qualifer	Comparison Criteria	Criterion Value	Exceedance Quotient
NBW42-DW01	Arsenic	µg/l	14.2		RBC Tap	0.04	318.04
NBW42-DW04	Arsenic	µg/l	19		RBC Tap	0.04	425.55
NBW42-DW01	Iron	µg/l	32100		RBC Tap	10950	2.93
NBW42-DW04	Iron	µg/l	13300		RBC Tap	10950	1.21
NBW42-DW04	Manganese	µg/l	771		RBC Tap	730	1.06
NBW42-DW05	Manganese	µg/l	743		RBC Tap	730	1.02
NBW42-DW05P	Manganese	µg/l	756		RBC Tap	730	1.04
NBW42-DW01	Thallium	µg/l	4.5	J	RBC Tap	2.56	1.76
NBW42-DW05	Thallium	µg/l	3	J	RBC Tap	2.56	1.17
NBW42-DW05P	Thallium	µg/l	3.7	J	RBC Tap	2.56	1.45

Notes:

J- Estimated Value

Exceedance Quotient = measured concentration/ criterion value
MCLs for analytes in table are as follows: Arsenic – 50 ug/L, Thallium – 2 ug/L. Secondary MCLs are as follows: Manganese - 50 ug/L, Iron – 300 ug/L. Secondary drinking water standards are unenforceable federal guidelines.

Table 3-2
Frequency of Detection and Concentration at DW03
SWMU 42 Groundwater

Frequency of Detection [1]	**Analyte**	**Units**	**DW03[2]**
2 of 5	Arsenic	µg/l	< 3.00
5 of 5	Iron	µg/l	763.00
5 of 5	Manganese	µg/l	315.00
2 of 5	Thallium	µg/l	< 2.00

Notes:

[1] - Frequency of detection from all samples collected at SWMU

[2] - Assumed upgradient based on topographic position and local surface water features.

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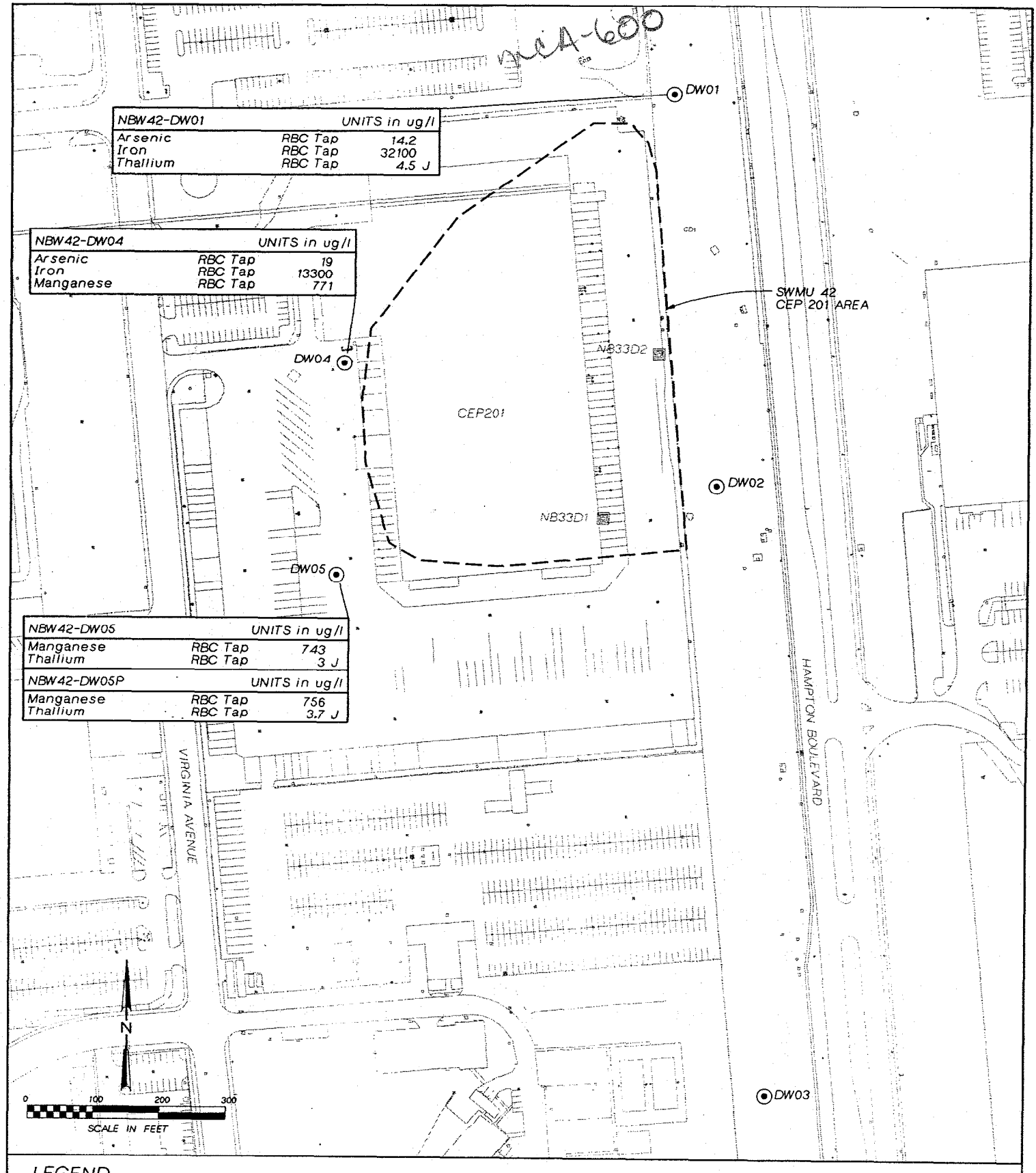

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PHASE I RRR SUBSURFACE SOIL SAMPLE LOCATION

SI GEOPROBE GROUNDWATER SAMPLING LOCATION

ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT

QUALIFIERS

J- Estimated value

Figure 3-1
SWMU 42 - CEP 201 AREA
GROUNDWATER EXCEEDANCES
Naval Base, Norfolk

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Soil

Two subsurface soil samples were collected during the RRR study field activities at SWMU 42. Compounds detected at concentrations that exceeded the residential and/or industrial RBCs are listed in Table 3-3.

Subsurface Soil Screening Criteria Exceedances

No organic compound was detected at a concentration exceeding the screening criteria in any soil sample. Arsenic was detected at a concentration exceeding the screening criteria at sampling location NB33D2. All sampling locations and screening criteria exceedances are shown on Figure 3-2.

Arsenic, detected at a concentration of 2.6 mg/kg at NB33D2, exceeded the residential RBC of 0.43 mg/kg.

Table 3-3
Subsurface Soil Exceedances
SWMU 42

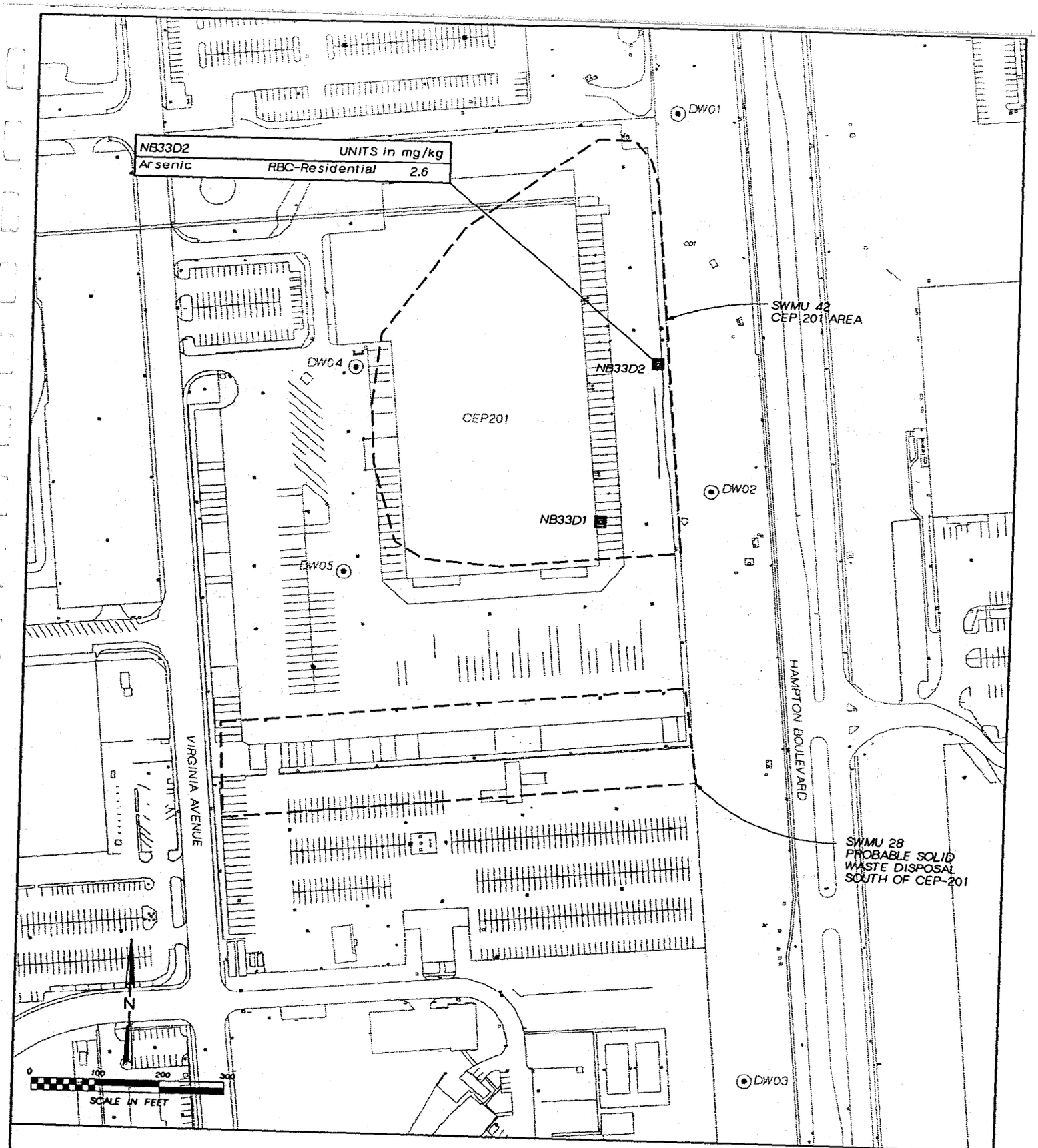
Sample ID	Compound	Units	Value	Qualifer	Comparison Criteria	Comparison Value	Exceedance Quotient
NB33D2	Arsenic, total	mg/kg	2.6		RBC-Residential Soil	0.43	6.11

Exceedance Quotient = measured concentration/ criteria value

Background Considerations

Background concentration data provide important information for risk management decisions. The Navy has recently initiated a study to establish basewide background concentrations (CH2MHill, May 2000). The results of this study revealed that arsenic concentrations detected within the soils ranged from 1.3 to 42.2 mg/kg. As a result, the surface soil exceedance concentrations for arsenic were within the range of concentrations from background samples.

As can be seen from Table 3-3, arsenic was detected at a concentration of 2.6 mg/kg at NB33D2 which is within the range of background arsenic concentration (1.3 to 42.2 mg/kg) detected at NSN.



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NB33D1 — PHASE I RRR SUBSURFACE SOIL SAMPLE LOCATION

SI GEOPROBE GROUNDWATER SAMPLING LOCATION

ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT

Figure 3-2
SWMU 42 - CEP 201 AREA
SOIL EXCEEDANCES
Naval Base, Norfolk

CH2MHILL

SWMU 42
Section 4

Conclusions and Recommendations

Groundwater

As noted in the introduction for this set of close-out reports, the results of groundwater sampling did not factor significantly into the NFA evaluations. The groundwater samples were collected using direct-push technology. Groundwater samples collected using direct-push technology are not considered sufficiently representative of actual groundwater conditions to be used for quantitative risk assessment or risk management decisions. The samples were used to make an initial evaluation of groundwater quality relative to the comparison criteria, and to see if any contaminants found at elevated concentrations in soils were also elevated in groundwater.

Iron, thallium, arsenic, and manganese were all detected at concentrations exceeding the tap water RBCs. Also, the concentrations of iron, arsenic, and thallium were higher than the most likely upgradient sample. Of these chemicals, only arsenic was found in elevated concentrations in soil, but the concentration was only slightly higher than the residential RBC or background concentration. In addition, the City of Norfolk supplies all potable water to the City and to Naval Station Norfolk, and there are no potable water supply wells at NSN.

Surface Soil

Arsenic concentrations were only slightly higher than the residential RBC and within the range of background concentrations detected at NSN.

Recommendation

On the basis of the available data, SWMU 42 does not present a threat to human health or the environment. Therefore, further evaluation or streamlined risk assessment is not warranted and the site can be closed as an NFA site.

References

Baker Environmental Inc., October 1995. Phase I Relative Risk Ranking Study.

Baker Environmental Inc., September 1996. Phase II Relative Risk Ranking Study.

CH2MHILL, May 2000 Draft Technical Memorandum for the Background Soils Evaluation at Naval Station Norfolk.

CH2M HILL, October 1998. Draft Report for the SWMU Supplemental Investigation, Naval Base Norfolk.

Naval Base Norfolk 2010 Land Use Plan – Navy Public Works Center Norfolk, August 1995.

Appendix A:
Analytical Detections

Table A-1
Compounds Detected in Groundwater
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
38	NBW38-DW04	MET	Copper	15.8	J	UG/L	6	1
38	NBW38-DW01	MET	Iron	4820		UG/L	9	1
38	NBW38-DW02	MET	Iron	7160		UG/L	9	1
38	NBW38-DW03	MET	Iron	1070		UG/L	9	1
38	NBW38-DW01	MET	Magnesium	20500		UG/L	130	1
38	NBW38-DW02	MET	Magnesium	16500		UG/L	130	1
38	NBW38-DW03	MET	Magnesium	30000		UG/L	130	1
38	NBW38-DW04	MET	Magnesium	23300		UG/L	130	1
38	NBW38-DW01	MET	Manganese	763	J	UG/L	2	1
38	NBW38-DW02	MET	Manganese	1720	J	UG/L	2	1
38	NBW38-DW03	MET	Manganese	254	J	UG/L	2	1
38	NBW38-DW04	MET	Manganese	534	J	UG/L	2	1
38	NBW38-DW01	MET	Potassium	3410	J	UG/L	170	1
38	NBW38-DW02	MET	Potassium	3080	J	UG/L	170	1
38	NBW38-DW03	MET	Potassium	3290	J	UG/L	170	1
38	NBW38-DW04	MET	Potassium	2240	J	UG/L	170	1
38	NBW38-DW01	MET	Selenium	4.6	K	UG/L	3	1
38	NBW38-DW03	MET	Selenium	10.3		UG/L	3	1
38	NBW38-DW04	MET	Selenium	7.3	K	UG/L	3	1
38	NBW38-DW01	MET	Silver	2.9	J	UG/L	1	1
38	NBW38-DW01	MET	Sodium	23900		UG/L	81	1
38	NBW38-DW02	MET	Sodium	25300		UG/L	81	1
38	NBW38-DW03	MET	Sodium	9510		UG/L	81	1
38	NBW38-DW04	MET	Sodium	7820		UG/L	81	1
38	NBW38-DW01	MET	Thallium	4.4	K	UG/L	2	1
38	NBW38-DW01	SVOA	bis(2-Ethylhexyl)phthalate	3	J	UG/L	10	1
38	NBW38-DW02	SVOA	bis(2-Ethylhexyl)phthalate	4	J	UG/L	10	1
38	NBW38-DW04	SVOA	bis(2-Ethylhexyl)phthalate	21		UG/L	10	1
38	NBW38-DW04	SVOA	Di-n-butylphthalate	2	J	UG/L	10	1
38	NBW38-DW02	VOA	Acetone	7	L	UG/L	5	1
40	NBW40-DW01	MET	Antimony	258		UG/L	2	1
40	NBW40-DW02	MET	Antimony	4.3	J	UG/L	2	1

Table A-1
Compounds Detected in Groundwater
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
40	NBW40-DW03	MET	Antimony	5.6	K	UG/L	2	1
40	NBW40-DW04	MET	Antimony	4.6	K	UG/L	2	1
40	NBW40-DW05	MET	Antimony	4.3	K	UG/L	2	1
40	NBW40-DW03	MET	Barium	34.6	J	UG/L	3	1
40	NBW40-DW04	MET	Barium	36.4	J	UG/L	3	1
40	NBW40-DW05	MET	Barium	12.6	J	UG/L	3	1
40	NBW40-DW06	MET	Barium	31	J	UG/L	3	1
40	NBW40-DW06P	MET	Barium	35.6	J	UG/L	3	1
40	NBW40-DW01	MET	Calcium	4370	J	UG/L	91	1
40	NBW40-DW02	MET	Calcium	32900		UG/L	91	1
40	NBW40-DW03	MET	Calcium	4650	J	UG/L	91	1
40	NBW40-DW04	MET	Calcium	6650		UG/L	91	1
40	NBW40-DW05	MET	Calcium	4590	J	UG/L	91	1
40	NBW40-DW06	MET	Calcium	4110	J	UG/L	91	1
40	NBW40-DW06P	MET	Calcium	4650	J	UG/L	91	1
40	NBW40-DW01	MET	Copper	52.1		UG/L	6	1
40	NBW40-DW02	MET	Copper	29.5		UG/L	6	1
40	NBW40-DW03	MET	Copper	29.8		UG/L	6	1
40	NBW40-DW04	MET	Copper	17.8	J	UG/L	6	1
40	NBW40-DW05	MET	Copper	46.7		UG/L	6	1
40	NBW40-DW01	MET	Iron	1170		UG/L	9	1
40	NBW40-DW02	MET	Iron	1270		UG/L	9	1
40	NBW40-DW03	MET	Iron	941	J	UG/L	9	1
40	NBW40-DW04	MET	Iron	1320	J	UG/L	9	1
40	NBW40-DW05	MET	Iron	464	J	UG/L	9	1
40	NBW40-DW06	MET	Iron	854	J	UG/L	9	1
40	NBW40-DW06P	MET	Iron	992	J	UG/L	9	1
40	NBW40-DW01	MET	Magnesium	982	J	UG/L	130	1
40	NBW40-DW02	MET	Magnesium	4170	J	UG/L	130	1
40	NBW40-DW03	MET	Magnesium	1570	J	UG/L	130	1
40	NBW40-DW04	MET	Magnesium	2610	J	UG/L	130	1
40	NBW40-DW05	MET	Magnesium	1490	J	UG/L	130	1

Table A-1
Compounds Detected in Groundwater
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
40	NBW40-DW06	MET	Magnesium	2930	J	UG/L	130	1
40	NBW40-DW06P	MET	Magnesium	3430	J	UG/L	130	1
40	NBW40-DW01	MET	Manganese	35	J	UG/L	2	1
40	NBW40-DW02	MET	Manganese	87.8	J	UG/L	2	1
40	NBW40-DW03	MET	Manganese	40.2		UG/L	2	1
40	NBW40-DW04	MET	Manganese	73.3		UG/L	2	1
40	NBW40-DW05	MET	Manganese	26.1		UG/L	2	1
40	NBW40-DW06	MET	Manganese	41.2		UG/L	2	1
40	NBW40-DW06P	MET	Manganese	48.2		UG/L	2	1
40	NBW40-DW06	MET	Mercury	0.13	L	UG/L	0.1	1
40	NBW40-DW01	MET	Potassium	7070		UG/L	170	1
40	NBW40-DW02	MET	Potassium	4340	J	UG/L	170	1
40	NBW40-DW03	MET	Potassium	4790	J	UG/L	170	1
40	NBW40-DW04	MET	Potassium	3830	J	UG/L	170	1
40	NBW40-DW05	MET	Potassium	6720		UG/L	170	1
40	NBW40-DW06	MET	Potassium	9950		UG/L	170	1
40	NBW40-DW06P	MET	Potassium	12000		UG/L	170	1
40	NBW40-DW01	MET	Sodium	5970		UG/L	81	1
40	NBW40-DW02	MET	Sodium	9310		UG/L	81	1
40	NBW40-DW03	MET	Sodium	4960	J	UG/L	81	1
40	NBW40-DW04	MET	Sodium	4470	J	UG/L	81	1
40	NBW40-DW05	MET	Sodium	5960		UG/L	81	1
40	NBW40-DW06	MET	Sodium	5650		UG/L	81	1
40	NBW40-DW06P	MET	Sodium	6670		UG/L	81	1
40	NBW40-DW04	MET	Thallium	3.8	K	UG/L	2	1
40	NBW40-DW05	SVOA	bis(2-Ethylhexyl)phthalate	1	J	UG/L	10	1
40	NBW40-DW01	VOA	Acetone	5	L	UG/L	5	1
40	NBW40-DW02	VOA	Acetone	8	L	UG/L	5	1
40	NBW40-DW03	VOA	Acetone	3	L	UG/L	5	1
41	NBW41-DW01	MET	Aluminum	56.7	J	UG/L	38	1
41	NBW41-DW02	MET	Aluminum	1570		UG/L	38	1
41	NBW41-DW03	MET	Aluminum	73.1	J	UG/L	38	1

Table A-1
Compounds Detected in Groundwater
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
41	NBW41-DW01	MET	Barium	60.3	J	UG/L	3	1
41	NBW41-DW02	MET	Barium	23	J	UG/L	3	1
41	NBW41-DW03	MET	Barium	33	J	UG/L	3	1
41	NBW41-DW02	MET	Beryllium	1.6	J	UG/L	0.6	1
41	NBW41-DW02	MET	Cadmium	3	K	UG/L	0.4	1
41	NBW41-DW01	MET	Calcium	53400		UG/L	91	1
41	NBW41-DW02	MET	Calcium	91900		UG/L	91	1
41	NBW41-DW03	MET	Calcium	43700		UG/L	91	1
41	NBW41-DW02	MET	Chromium	6.2	K	UG/L	5	1
41	NBW41-DW01	MET	Cobalt	20.5	J	UG/L	6	1
41	NBW41-DW02	MET	Cobalt	53.9		UG/L	6	1
41	NBW41-DW03	MET	Cobalt	8.4	J	UG/L	6	1
41	NBW41-DW02	MET	Copper	35.1	K	UG/L	6	1
41	NBW41-DW01	MET	Iron	4020		UG/L	9	1
41	NBW41-DW02	MET	Iron	5590		UG/L	9	1
41	NBW41-DW03	MET	Iron	3230		UG/L	9	1
41	NBW41-DW01	MET	Magnesium	7140		UG/L	130	1
41	NBW41-DW02	MET	Magnesium	32200		UG/L	130	1
41	NBW41-DW03	MET	Magnesium	20200		UG/L	130	1
41	NBW41-DW01	MET	Manganese	682		UG/L	2	1
41	NBW41-DW02	MET	Manganese	1970		UG/L	2	1
41	NBW41-DW03	MET	Manganese	813		UG/L	2	1
41	NBW41-DW01	MET	Nickel	13.3	K	UG/L	6	1
41	NBW41-DW02	MET	Nickel	45.4	K	UG/L	6	1
41	NBW41-DW03	MET	Nickel	8.9	K	UG/L	6	1
41	NBW41-DW01	MET	Potassium	5890		UG/L	170	1
41	NBW41-DW02	MET	Potassium	9310		UG/L	170	1
41	NBW41-DW03	MET	Potassium	4540	J	UG/L	170	1
41	NBW41-DW01	MET	Sodium	24200		UG/L	81	1
41	NBW41-DW02	MET	Sodium	19800		UG/L	81	1
41	NBW41-DW03	MET	Sodium	24500		UG/L	81	1
41	NBW41-DW03	MET	Thallium	1.7	K	UG/L	2	1

Table A-1
Compounds Detected in Groundwater
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
41	NBW41-DW03	VOA	Methylene Chloride	1	J	UG/L	2	1
42	NBW42-DW01	MET	Arsenic	14.2		UG/L	3	1
42	NBW42-DW04	MET	Arsenic	19		UG/L	3	1
42	NBW42-DW01	MET	Barium	71	J	UG/L	3	1
42	NBW42-DW02	MET	Barium	46.9	J	UG/L	3	1
42	NBW42-DW03	MET	Barium	30.2	J	UG/L	3	1
42	NBW42-DW04	MET	Barium	80.8	J	UG/L	3	1
42	NBW42-DW05	MET	Barium	28.2	J	UG/L	3	1
42	NBW42-DW05P	MET	Barium	26.8	J	UG/L	3	1
42	NBW42-DW01	MET	Calcium	99100		UG/L	91	1
42	NBW42-DW02	MET	Calcium	87000		UG/L	91	1
42	NBW42-DW03	MET	Calcium	45300		UG/L	91	1
42	NBW42-DW04	MET	Calcium	164000		UG/L	91	1
42	NBW42-DW05	MET	Calcium	47100		UG/L	91	1
42	NBW42-DW05P	MET	Calcium	47400		UG/L	91	1
42	NBW42-DW03	MET	Cobalt	6.4	J	UG/L	6	1
42	NBW42-DW05	MET	Cobalt	15.7	J	UG/L	6	1
42	NBW42-DW05P	MET	Cobalt	15.7	J	UG/L	6	1
42	NBW42-DW01	MET	Copper	38.9		UG/L	6	1
42	NBW42-DW02	MET	Copper	13.8	J	UG/L	6	1
42	NBW42-DW03	MET	Copper	31.3		UG/L	6	1
42	NBW42-DW04	MET	Copper	27.9		UG/L	6	1
42	NBW42-DW05P	MET	Copper	28.3		UG/L	6	1
42	NBW42-DW01	MET	Iron	32100		UG/L	9	1
42	NBW42-DW02	MET	Iron	920		UG/L	9	1
42	NBW42-DW03	MET	Iron	763		UG/L	9	1
42	NBW42-DW04	MET	Iron	13300		UG/L	9	1
42	NBW42-DW05	MET	Iron	1470		UG/L	9	1
42	NBW42-DW05P	MET	Iron	1630		UG/L	9	1
42	NBW42-DW02	MET	Lead	7.2		UG/L	1	1
42	NBW42-DW03	MET	Lead	2.3	K	UG/L	1	1
42	NBW42-DW04	MET	Lead	5.9	K	UG/L	1	1

Table A-1
Compounds Detected in Groundwater
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
42	NBW42-DW01	MET	Magnesium	21500		UG/L	130	1
42	NBW42-DW02	MET	Magnesium	23900		UG/L	130	1
42	NBW42-DW03	MET	Magnesium	13500		UG/L	130	1
42	NBW42-DW04	MET	Magnesium	44500		UG/L	130	1
42	NBW42-DW05	MET	Magnesium	29900		UG/L	130	1
42	NBW42-DW05P	MET	Magnesium	29800		UG/L	130	1
42	NBW42-DW01	MET	Manganese	314		UG/L	2	1
42	NBW42-DW02	MET	Manganese	189		UG/L	2	1
42	NBW42-DW03	MET	Manganese	315		UG/L	2	1
42	NBW42-DW04	MET	Manganese	771		UG/L	2	1
42	NBW42-DW05	MET	Manganese	743		UG/L	2	1
42	NBW42-DW05P	MET	Manganese	756		UG/L	2	1
42	NBW42-DW01	MET	Potassium	14200		UG/L	170	1
42	NBW42-DW02	MET	Potassium	7030		UG/L	170	1
42	NBW42-DW03	MET	Potassium	1900	J	UG/L	170	1
42	NBW42-DW04	MET	Potassium	16800		UG/L	170	1
42	NBW42-DW05	MET	Potassium	2770	J	UG/L	170	1
42	NBW42-DW05P	MET	Potassium	2770	J	UG/L	170	1
42	NBW42-DW01	MET	Sodium	30100		UG/L	81	1
42	NBW42-DW02	MET	Sodium	34200		UG/L	81	1
42	NBW42-DW03	MET	Sodium	16200		UG/L	81	1
42	NBW42-DW04	MET	Sodium	33300		UG/L	81	1
42	NBW42-DW05	MET	Sodium	27800		UG/L	81	1
42	NBW42-DW05P	MET	Sodium	27700		UG/L	81	1
42	NBW42-DW01	MET	Thallium	4.5	J	UG/L	2	1
42	NBW42-DW05	MET	Thallium	3	J	UG/L	2	1
42	NBW42-DW05P	MET	Thallium	3.7	J	UG/L	2	1
42	NBW42-DW02	SVOA	bis(2-Ethylhexyl)phthalate	2	J	UG/L	10	1
42	NBW42-DW03	SVOA	bis(2-Ethylhexyl)phthalate	1	J	UG/L	10	1
42	NBW42-DW04	SVOA	Naphthalene	2	J	UG/L	10	1
42	NBW42-DW01	VOA	Acetone	5	L	UG/L	5	1
42	NBW42-DW02	VOA	Acetone	6	L	UG/L	5	1

Table A-1
Compounds Detected in Groundwater
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
42	NBW42-DW04	VOA	Acetone	7	L	UG/L	5	1
42	NBW42-DW03	VOA	Carbon Disulfide	1		UG/L	1	1
42	NBW42-DW02	VOA	Methylene Chloride	1	J	UG/L	2	1
42	NBW42-DW04	VOA	Methylene Chloride	2	J	UG/L	2	1
42	NBW42-DW05	VOA	Tetrachloroethene	0.6	J	UG/L	1	1
42	NBW42-DW05P	VOA	Tetrachloroethene	0.6	J	UG/L	1	1

Table A-2
Compounds Detected in Surface Soil
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
38	NB48S1	INORG	Cobalt	18.6		MG/KG		
38	NB48S1	INORG	Copper	85		MG/KG		
38	NB48S1	INORG	Iron	35400		MG/KG		
38	NB48S1	INORG	Lead	133		MG/KG		
38	NB48S1	INORG	Magnesium	24000		MG/KG		
38	NB48S1	INORG	Manganese-Food	357		MG/KG		
38	NB48S1	INORG	Mercury	0.09		MG/KG		
38	NB48S1	INORG	Nickel	61.6		MG/KG		
38	NB48S1	INORG	Potassium	411		MG/KG		
38	NB48S1	INORG	Selenium	1.1		MG/KG		
38	NB48S1	INORG	Sodium	95.5		MG/KG		
38	NB48S1	INORG	Vanadium	26.8		MG/KG		
38	NB48S1	INORG	Zinc	106		MG/KG		
38	NB48S1	SVOA	2-Methylnaphthalene	410	J	UG/KG		
38	NB48S1	SVOA	Acenaphthene	180	J	UG/KG		
38	NB48S1	SVOA	Anthracene	350	J	UG/KG		
38	NB48S1	SVOA	Benz(a)anthracene	320	J	UG/KG		
38	NB48S1	SVOA	Benzo(a)pyrene	1700		UG/KG		
38	NB48S1	SVOA	Benzo(b)fluoranthene	1800		UG/KG		
38	NB48S1	SVOA	Benzo(g,h,i)perylene	1400		UG/KG		
38	NB48S1	SVOA	Benzo(k)fluoranthene	2100		UG/KG		
38	NB48S1	SVOA	Bis(2-ethylhexyl)phthalate	58	J	UG/KG		
38	NB48S1	SVOA	Carbazole	110	J	UG/KG		
38	NB48S1	SVOA	Chrysene	1500		UG/KG		
38	NB48S1	SVOA	Dibenzofuran	190	J	UG/KG		
38	NB48S1	SVOA	Fluoranthene	570		UG/KG		
38	NB48S1	SVOA	Indeno(1,2,3-c,d)pyrene	1200		UG/KG		
38	NB48S1	SVOA	Naphthalene	320	J	UG/KG		
38	NB48S1	SVOA	Phenanthrene	760		UG/KG		
38	NB48S1	SVOA	Pyrene	1000		UG/KG		
40	NBW40-SS01	INORG	Aluminum,total	10700		MG/KG	9.49	1
40	NBW40-SS02	INORG	Aluminum,total	9550		MG/KG	7.25	1

Table A-2
Compounds Detected in Surface Soil
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
40	NBW40-SS02P	INORG	Aluminum,total	14000		MG/KG	7.55	1
40	NBW40-SS03	INORG	Aluminum,total	7440		MG/KG	7.53	1
40	NBW40-SS04	INORG	Aluminum,total	5000		MG/KG	6.29	1
40	NBW40-SS01	INORG	Antimony, total	0.61	L	MG/KG	0.42	1
40	NBW40-SS01	INORG	Arsenic, total	2.2	J	MG/KG	0.79	1
40	NBW40-SS02	INORG	Arsenic, total	0.81	J	MG/KG	0.6	1
40	NBW40-SS02P	INORG	Arsenic, total	2.1		MG/KG	0.63	1
40	NBW40-SS03	INORG	Arsenic, total	1.7		MG/KG	0.63	1
40	NBW40-SS04	INORG	Arsenic, total	1.2	J	MG/KG	0.52	1
40	NBW40-SS01	INORG	Barium, total	36.3	J	MG/KG	0.64	1
40	NBW40-SS02	INORG	Barium, total	42.4		MG/KG	0.49	1
40	NBW40-SS02P	INORG	Barium, total	43.9		MG/KG	0.51	1
40	NBW40-SS03	INORG	Barium, total	34.5	J	MG/KG	0.5	1
40	NBW40-SS04	INORG	Barium, total	29.5		MG/KG	0.42	1
40	NBW40-SS01	INORG	Beryllium, total	0.27	J	MG/KG	0.2	1
40	NBW40-SS02	INORG	Beryllium, total	0.2	J	MG/KG	0.15	1
40	NBW40-SS02P	INORG	Beryllium, total	0.21	J	MG/KG	0.16	1
40	NBW40-SS03	INORG	Beryllium, total	0.21	J	MG/KG	0.16	1
40	NBW40-SS01	INORG	Calcium, total	457	J	MG/KG	33.75	1
40	NBW40-SS02	INORG	Calcium, total	391	J	MG/KG	25.78	1
40	NBW40-SS02P	INORG	Calcium, total	292	J	MG/KG	26.86	1
40	NBW40-SS03	INORG	Calcium, total	242	J	MG/KG	26.77	1
40	NBW40-SS04	INORG	Calcium, total	119	J	MG/KG	22.35	1
40	NBW40-SS01	INORG	Chromium, total	12.1		MG/KG	1.34	1
40	NBW40-SS02	INORG	Chromium, total	9.2		MG/KG	1.02	1
40	NBW40-SS02P	INORG	Chromium, total	14.4		MG/KG	1.06	1
40	NBW40-SS03	INORG	Chromium, total	8.8		MG/KG	1.06	1
40	NBW40-SS04	INORG	Chromium, total	4.2		MG/KG	0.89	1
40	NBW40-SS01	INORG	Cobalt, total	1.5	J	MG/KG	1.1	1
40	NBW40-SS02	INORG	Cobalt, total	1.4	J	MG/KG	0.84	1
40	NBW40-SS02P	INORG	Cobalt, total	2	J	MG/KG	0.87	1
40	NBW40-SS03	INORG	Cobalt, total	1.3	J	MG/KG	0.87	1

Table A-2
Compounds Detected in Surface Soil
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
40	NBW40-SS01	INORG	Copper, total	4.5	J	MG/KG	1.1	1
40	NBW40-SS02	INORG	Copper, total	3.3	J	MG/KG	0.84	1
40	NBW40-SS02P	INORG	Copper, total	5.5		MG/KG	0.87	1
40	NBW40-SS03	INORG	Copper, total	2.9	J	MG/KG	0.87	1
40	NBW40-SS04	INORG	Copper, total	1.9	J	MG/KG	0.73	1
40	NBW40-SS01	INORG	Iron, total	9170		MG/KG	2.13	1
40	NBW40-SS02	INORG	Iron, total	6070		MG/KG	1.62	1
40	NBW40-SS02P	INORG	Iron, total	10500		MG/KG	1.69	1
40	NBW40-SS03	INORG	Iron, total	6400		MG/KG	1.69	1
40	NBW40-SS04	INORG	Iron, total	3570		MG/KG	1.41	1
40	NBW40-SS01	INORG	Lead, total	7.6		MG/KG	0.48	1
40	NBW40-SS02	INORG	Lead, total	9.4	K	MG/KG	0.37	1
40	NBW40-SS02P	INORG	Lead, total	8.5	K	MG/KG	0.38	1
40	NBW40-SS03	INORG	Lead, total	5.9	K	MG/KG	0.38	1
40	NBW40-SS04	INORG	Lead, total	6.5	K	MG/KG	0.32	1
40	NBW40-SS01	INORG	Magnesium, total	481	K	MG/KG	26.06	1
40	NBW40-SS02	INORG	Magnesium, total	710	J	MG/KG	19.9	1
40	NBW40-SS02P	INORG	Magnesium, total	699	J	MG/KG	20.73	1
40	NBW40-SS03	INORG	Magnesium, total	496	J	MG/KG	20.67	1
40	NBW40-SS04	INORG	Magnesium, total	384	J	MG/KG	17.26	1
40	NBW40-SS01	INORG	Manganese, total	10.6	J	MG/KG	0.48	1
40	NBW40-SS02	INORG	Manganese, total	21.5		MG/KG	0.37	1
40	NBW40-SS02P	INORG	Manganese, total	18.6		MG/KG	0.38	1
40	NBW40-SS03	INORG	Manganese, total	14.8		MG/KG	0.38	1
40	NBW40-SS04	INORG	Manganese, total	11		MG/KG	0.32	1
40	NBW40-SS04	INORG	Mercury, total	0.18		MG/KG	0.05	1
40	NBW40-SS01	INORG	Nickel, total	2.5	J	MG/KG	1.93	1
40	NBW40-SS02	INORG	Nickel, total	3	J	MG/KG	1.47	1
40	NBW40-SS02P	INORG	Nickel, total	4	J	MG/KG	1.53	1
40	NBW40-SS03	INORG	Nickel, total	1.7	J	MG/KG	1.53	1
40	NBW40-SS01	INORG	Potassium, total	352	J	MG/KG	53.69	1
40	NBW40-SS02	INORG	Potassium, total	409	J	MG/KG	41.01	1

Table A-2
Compounds Detected in Surface Soil
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
40	NBW40-SS02P	INORG	Potassium, total	602	J	MG/KG	42.72	1
40	NBW40-SS03	INORG	Potassium, total	339	J	MG/KG	42.59	1
40	NBW40-SS04	INORG	Potassium, total	171	J	MG/KG	35.56	1
40	NBW40-SS02P	INORG	Silver, total	1.1	J	MG/KG	0.17	1
40	NBW40-SS01	INORG	Vanadium, total	17.9		MG/KG	1.16	1
40	NBW40-SS02	INORG	Vanadium, total	16.5		MG/KG	0.89	1
40	NBW40-SS02P	INORG	Vanadium, total	23.2		MG/KG	0.92	1
40	NBW40-SS03	INORG	Vanadium, total	14		MG/KG	0.92	1
40	NBW40-SS04	INORG	Vanadium, total	9		MG/KG	0.77	1
40	NBW40-SS01	INORG	Zinc, total	9.8		MG/KG	0.68	1
40	NBW40-SS01	SVOA	Benzo(b)fluoranthene	44	J	UG/KG	360	1
40	NBW40-SS01	SVOA	bis(2-Ethylhexyl)phthalate	54	J	UG/KG	360	1
40	NBW40-SS02	SVOA	bis(2-Ethylhexyl)phthalate	66	J	UG/KG	370	1
40	NBW40-SS02P	SVOA	bis(2-Ethylhexyl)phthalate	290	J	UG/KG	360	1
40	NBW40-SS03	SVOA	bis(2-Ethylhexyl)phthalate	64	J	UG/KG	370	1
40	NBW40-SS04	SVOA	bis(2-Ethylhexyl)phthalate	130	J	UG/KG	370	1
40	NBW40-SS01	SVOA	Chrysene	41	J	UG/KG	360	1
40	NBW40-SS01	SVOA	Di-n-butylphthalate	50	J	UG/KG	360	1
40	NBW40-SS02	SVOA	Di-n-butylphthalate	56	J	UG/KG	370	1
40	NBW40-SS03	SVOA	Di-n-butylphthalate	54	J	UG/KG	370	1
40	NBW40-SS04	SVOA	Di-n-butylphthalate	41	J	UG/KG	370	1
40	NBW40-SS01	SVOA	Fluoranthene	65	J	UG/KG	360	1
40	NBW40-SS01	SVOA	Pyrene	63	J	UG/KG	360	1
40	NBW40-SS02P	VOA	INORGhylene Chloride	21		UG/KG	12	1
40	NBW40-SS02	VOA	Toluene	2	J	UG/KG	11	1
40	NBW40-SS02P	VOA	Toluene	2	J	UG/KG	12	1
40	NBW40-SS03	VOA	Toluene	2	J	UG/KG	11	1
40	NBW40-SS04	VOA	Toluene	2	J	UG/KG	11	1
41	NBW41-SS01	INORG	Aluminum,total	3830		MG/KG	8.61	1
41	NBW41-SS02	INORG	Aluminum,total	3520		MG/KG	8.46	1
41	NBW41-SS03	INORG	Aluminum,total	3830		MG/KG	8.73	1
41	NBW41-SS03P	INORG	Aluminum,total	4210		MG/KG	9.21	1

Table A-2
Compounds Detected in Surface Soil
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
41	NBW41-SS01	INORG	Arsenic, total	1.7	K	MG/KG	0.46	1
41	NBW41-SS02	INORG	Arsenic, total	3	K	MG/KG	0.45	1
41	NBW41-SS03	INORG	Arsenic, total	2.9	K	MG/KG	0.46	1
41	NBW41-SS03P	INORG	Arsenic, total	3.2	K	MG/KG	0.49	1
41	NBW41-SS01	INORG	Barium, total	30.3	J	MG/KG	0.58	1
41	NBW41-SS02	INORG	Barium, total	21	J	MG/KG	0.57	1
41	NBW41-SS03	INORG	Barium, total	20.9	J	MG/KG	0.58	1
41	NBW41-SS03P	INORG	Barium, total	20.5	L	MG/KG	0.62	1
41	NBW41-SS01	INORG	Beryllium, total	0.33	J	MG/KG	0.18	1
41	NBW41-SS02	INORG	Beryllium, total	0.18	J	MG/KG	0.18	1
41	NBW41-SS03	INORG	Cadmium, total	0.73	K	MG/KG	0.06	1
41	NBW41-SS01	INORG	Calcium, total	773	J	MG/KG	30.63	1
41	NBW41-SS02	INORG	Calcium, total	921	J	MG/KG	30.09	1
41	NBW41-SS03	INORG	Calcium, total	949	J	MG/KG	31.03	1
41	NBW41-SS03P	INORG	Calcium, total	855	J	MG/KG	32.76	1
41	NBW41-SS01	INORG	Chromium, total	8		MG/KG	1.21	1
41	NBW41-SS02	INORG	Chromium, total	6.1		MG/KG	1.19	1
41	NBW41-SS03	INORG	Chromium, total	11.8		MG/KG	1.23	1
41	NBW41-SS03P	INORG	Chromium, total	11.2		MG/KG	1.3	1
41	NBW41-SS01	INORG	Cobalt, total	3.6	J	MG/KG	0.99	1
41	NBW41-SS03P	INORG	Cobalt, total	1.5	J	MG/KG	1.06	1
41	NBW41-SS01	INORG	Copper, total	6.7	K	MG/KG	0.99	1
41	NBW41-SS02	INORG	Copper, total	6.5	K	MG/KG	0.98	1
41	NBW41-SS03	INORG	Copper, total	6.7	K	MG/KG	1.01	1
41	NBW41-SS01	INORG	Iron, total	6680		MG/KG	1.93	1
41	NBW41-SS02	INORG	Iron, total	4300		MG/KG	1.9	1
41	NBW41-SS03	INORG	Iron, total	4540		MG/KG	1.95	1
41	NBW41-SS03P	INORG	Iron, total	4520		MG/KG	2.06	1
41	NBW41-SS01	INORG	Lead, total	8.4		MG/KG	0.34	1
41	NBW41-SS02	INORG	Lead, total	23.7		MG/KG	0.33	1
41	NBW41-SS03	INORG	Lead, total	15.3		MG/KG	0.34	1
41	NBW41-SS03P	INORG	Lead, total	14.4		MG/KG	0.36	1

Table A-2
Compounds Detected in Surface Soil
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
41	NBW41-SS01	INORG	Magnesium, total	539	J	MG/KG	23.65	1
41	NBW41-SS02	INORG	Magnesium, total	545	J	MG/KG	23.23	1
41	NBW41-SS03	INORG	Magnesium, total	524	J	MG/KG	23.96	1
41	NBW41-SS03P	INORG	Magnesium, total	499	J	MG/KG	25.29	1
41	NBW41-SS01	INORG	Manganese, total	121		MG/KG	0.44	1
41	NBW41-SS02	INORG	Manganese, total	24.5		MG/KG	0.43	1
41	NBW41-SS03	INORG	Manganese, total	53.4		MG/KG	0.44	1
41	NBW41-SS03P	INORG	Manganese, total	47.5		MG/KG	0.47	1
41	NBW41-SS02	INORG	Mercury, total	0.09	L	MG/KG	0.04	1
41	NBW41-SS03	INORG	Mercury, total	0.23	L	MG/KG	0.05	1
41	NBW41-SS03P	INORG	Mercury, total	0.34	L	MG/KG	0.06	1
41	NBW41-SS01	INORG	Nickel, total	6.3	K	MG/KG	1.75	1
41	NBW41-SS02	INORG	Nickel, total	3.7	K	MG/KG	1.72	1
41	NBW41-SS03	INORG	Nickel, total	5.8	K	MG/KG	1.77	1
41	NBW41-SS03P	INORG	Nickel, total	5.5	K	MG/KG	1.87	1
41	NBW41-SS01	INORG	Potassium, total	401	J	MG/KG	48.72	1
41	NBW41-SS02	INORG	Potassium, total	316	J	MG/KG	47.87	1
41	NBW41-SS03	INORG	Potassium, total	340	J	MG/KG	49.37	1
41	NBW41-SS03P	INORG	Potassium, total	366	J	MG/KG	52.12	1
41	NBW41-SS01	INORG	Silver, total	1.8	J	MG/KG	0.56	1
41	NBW41-SS02	INORG	Silver, total	0.92	J	MG/KG	0.55	1
41	NBW41-SS03	INORG	Silver, total	0.96	J	MG/KG	0.56	1
41	NBW41-SS03P	INORG	Silver, total	1.1	J	MG/KG	0.6	1
41	NBW41-SS01	INORG	Vanadium, total	13.4		MG/KG	1.05	1
41	NBW41-SS02	INORG	Vanadium, total	11.5		MG/KG	1.04	1
41	NBW41-SS03	INORG	Vanadium, total	10.4		MG/KG	1.07	1
41	NBW41-SS03P	INORG	Vanadium, total	10.6		MG/KG	1.13	1
41	NBW41-SS02	PEST	4,4'-DDD	430		UG/KG	3.6	1
41	NBW41-SS03	PEST	4,4'-DDD	37	L	UG/KG	3.9	1
41	NBW41-SS03P	PEST	4,4'-DDD	130		UG/KG	3.7	1
41	NBW41-SS01	PEST	4,4'-DDE	2.2	J	UG/KG	3.7	1
41	NBW41-SS02	PEST	4,4'-DDE	99		UG/KG	3.6	1

Table A-2
Compounds Detected in Surface Soil
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
41	NBW41-SS03	PEST	4,4'-DDE	26	L	UG/KG	3.9	1
41	NBW41-SS03P	PEST	4,4'-DDE	46		UG/KG	3.7	1
41	NBW41-SS02	PEST	4,4'-DDT	50		UG/KG	3.6	1
41	NBW41-SS03	PEST	4,4'-DDT	31	J	UG/KG	3.9	1
41	NBW41-SS03P	PEST	4,4'-DDT	58		UG/KG	3.7	1
41	NBW41-SS01	PEST	alpha-Chlordane	2.3	L	UG/KG	2	1
41	NBW41-SS02	PEST	alpha-Chlordane	3.9	J	UG/KG	1.8	1
41	NBW41-SS03	PEST	alpha-Chlordane	2.8	J	UG/KG	2	1
41	NBW41-SS03P	PEST	alpha-Chlordane	6.5		UG/KG	1.9	1
41	NBW41-SS01	PEST	Dieldrin	4.3	L	UG/KG	3.7	1
41	NBW41-SS02	PEST	Dieldrin	15	J	UG/KG	3.6	1
41	NBW41-SS03	PEST	Dieldrin	8.2	J	UG/KG	3.9	1
41	NBW41-SS03P	PEST	Dieldrin	16	J	UG/KG	3.7	1
41	NBW41-SS02	PEST	Endrin	5.9	J	UG/KG	3.6	1
41	NBW41-SS01	PEST	gamma-Chlordane	2.3	J	UG/KG	2	1
41	NBW41-SS02	PEST	gamma-Chlordane	5.5	J	UG/KG	1.8	1
41	NBW41-SS03P	PEST	gamma-Chlordane	2	J	UG/KG	1.9	1
41	NBW41-SS01	SVOA	Anthracene	60	J	UG/KG	370	1
41	NBW41-SS01	SVOA	Benzo(a)anthracene	300	J	UG/KG	370	1
41	NBW41-SS01	SVOA	Benzo(a)pyrene	240	J	UG/KG	370	1
41	NBW41-SS01	SVOA	Benzo(b)fluoranthene	390		UG/KG	370	1
41	NBW41-SS02	SVOA	Benzo(b)fluoranthene	47	J	UG/KG	360	1
41	NBW41-SS03P	SVOA	Benzo(b)fluoranthene	38	J	UG/KG	370	1
41	NBW41-SS01	SVOA	Benzo(g,h,I)perylene	47	J	UG/KG	360	1
41	NBW41-SS01	SVOA	Benzo(k)fluoranthene	130	J	UG/KG	370	1
41	NBW41-SS01	SVOA	bis(2-Ethylhexyl)phthalate	57	J	UG/KG	370	1
41	NBW41-SS02	SVOA	bis(2-Ethylhexyl)phthalate	39	J	UG/KG	360	1
41	NBW41-SS03	SVOA	bis(2-Ethylhexyl)phthalate	120	J	UG/KG	390	1
41	NBW41-SS03P	SVOA	bis(2-Ethylhexyl)phthalate	48	J	UG/KG	370	1
41	NBW41-SS01	SVOA	Chrysene	320	J	UG/KG	370	1
41	NBW41-SS03	SVOA	Di-n-butylphthalate	83	J	UG/KG	390	1
41	NBW41-SS03P	SVOA	Di-n-butylphthalate	50	J	UG/KG	370	1

Table A-2
Compounds Detected in Surface Soil
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
41	NBW41-SS01	SVOA	Fluoranthene	600		UG/KG	370	1
41	NBW41-SS02	SVOA	Fluoranthene	44	J	UG/KG	360	1
41	NBW41-SS03P	SVOA	Fluoranthene	40	J	UG/KG	370	1
41	NBW41-SS01	SVOA	Indeno(1,2,3-cd)pyrene	160	J	UG/KG	370	1
41	NBW41-SS01	SVOA	Phenanthrene	160	J	UG/KG	370	1
41	NBW41-SS01	SVOA	Pyrene	400		UG/KG	370	1
41	NBW41-SS02	SVOA	Pyrene	47	J	UG/KG	360	1
41	NBW41-SS01	VOA	Toluene	4	J	UG/KG	11	1
41	NBW41-SS02	VOA	Toluene	17		UG/KG	11	1
41	NBW41-SS03	VOA	Toluene	5	J	UG/KG	11	1
41	NBW41-SS03P	VOA	Toluene	3	J	UG/KG	10	1

Table A-3
Compounds Detected in Subsurface Soil
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
35	NB32D2	SVOA	Chrysene	300	J	UG/KG		
35	NB32D2	SVOA	Di-n-butylphthalate	860		UG/KG		
35	NB32D1	SVOA	Dibenz(a,h)anthracene	120	J	UG/KG		
35	NB32D1	SVOA	Dibenzofuran	74	J	UG/KG		
35	NB32D2	SVOA	Dibenzofuran	62	J	UG/KG		
35	NB32D1	SVOA	Fluoranthene	2400		UG/KG		
35	NB32D1	SVOA	Fluorene	160	J	UG/KG		
35	NB32D2	SVOA	Fluorene	44	J	UG/KG		
35	NB32D1	SVOA	Indeno(1,2,3-c,d)pyrene	240	J	UG/KG		
35	NB32D2	SVOA	Indeno(1,2,3-c,d)pyrene	110	J	UG/KG		
35	NB32D2	SVOA	Naphthalene	90	J	UG/KG		
35	NB32D1	SVOA	Phenanthrene	1700		UG/KG		
35	NB32D2	SVOA	Phenanthrene	330	J	UG/KG		
35	NB32D1	SVOA	Pyrene	1900		UG/KG		
35	NB32D2	SVOA	Pyrene	350	J	UG/KG		
35	NB32D2	VOA	Acetone	41		UG/KG		
35	NB32D2	VOA	Methyl Ethyl Ketone (2-Butanone	5.5	J	UG/KG		
40	NBW40-DS01	INORG	Aluminum,total	6850		MG/KG	8.58	1
40	NBW40-DS02	INORG	Aluminum,total	4810		MG/KG	8.57	1
40	NBW40-DS02P	INORG	Aluminum,total	11300		MG/KG	7.39	1
40	NBW40-DS03	INORG	Aluminum,total	11600		MG/KG	8.56	1
40	NBW40-DS04	INORG	Aluminum,total	3940		MG/KG	8.04	1
40	NBW40-DS01	INORG	Arsenic, total	0.95	J	MG/KG	0.71	1
40	NBW40-DS02P	INORG	Arsenic, total	1.9		MG/KG	0.61	1
40	NBW40-DS03	INORG	Arsenic, total	1.8	J	MG/KG	0.71	1
40	NBW40-DS04	INORG	Arsenic, total	2		MG/KG	0.67	1
40	NBW40-DS01	INORG	Barium, total	16.8	J	MG/KG	0.57	1
40	NBW40-DS02	INORG	Barium, total	20.5	J	MG/KG	0.57	1
40	NBW40-DS02P	INORG	Barium, total	42		MG/KG	0.5	1
40	NBW40-DS03	INORG	Barium, total	39.1	J	MG/KG	0.57	1
40	NBW40-DS02P	INORG	Beryllium, total	0.37	J	MG/KG	0.15	1
40	NBW40-DS03	INORG	Beryllium, total	0.24	J	MG/KG	0.18	1

Table A-3
Compounds Detected in Subsurface Soil
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
40	NBW40-DS01	INORG	Calcium, total	165	J	MG/KG	30.53	1
40	NBW40-DS02	INORG	Calcium, total	80.5	J	MG/KG	30.47	1
40	NBW40-DS02P	INORG	Calcium, total	321	J	MG/KG	26.3	1
40	NBW40-DS03	INORG	Calcium, total	249	J	MG/KG	30.43	1
40	NBW40-DS01	INORG	Chromium, total	6.1		MG/KG	1.21	1
40	NBW40-DS02	INORG	Chromium, total	5.4		MG/KG	1.21	1
40	NBW40-DS02P	INORG	Chromium, total	11.3		MG/KG	1.04	1
40	NBW40-DS03	INORG	Chromium, total	13.3		MG/KG	1.21	1
40	NBW40-DS04	INORG	Chromium, total	4		MG/KG	1.13	1
40	NBW40-DS01	INORG	Cobalt, total	1.8	J	MG/KG	0.99	1
40	NBW40-DS02P	INORG	Cobalt, total	1.3	J	MG/KG	0.85	1
40	NBW40-DS03	INORG	Cobalt, total	1.5	J	MG/KG	0.99	1
40	NBW40-DS01	INORG	Copper, total	3.1	J	MG/KG	0.99	1
40	NBW40-DS02	INORG	Copper, total	1.8	J	MG/KG	0.99	1
40	NBW40-DS02P	INORG	Copper, total	4.5		MG/KG	0.85	1
40	NBW40-DS03	INORG	Copper, total	4.3	J	MG/KG	0.99	1
40	NBW40-DS04	INORG	Copper, total	2.5	J	MG/KG	0.93	1
40	NBW40-DS01	INORG	Iron, total	4250		MG/KG	1.92	1
40	NBW40-DS02	INORG	Iron, total	4770		MG/KG	1.92	1
40	NBW40-DS02P	INORG	Iron, total	8540		MG/KG	1.66	1
40	NBW40-DS03	INORG	Iron, total	10000		MG/KG	1.92	1
40	NBW40-DS04	INORG	Iron, total	3650		MG/KG	1.8	1
40	NBW40-DS01	INORG	Lead, total	4.7	K	MG/KG	0.44	1
40	NBW40-DS02	INORG	Lead, total	3.8	K	MG/KG	0.44	1
40	NBW40-DS02P	INORG	Lead, total	7.1	K	MG/KG	0.38	1
40	NBW40-DS03	INORG	Lead, total	6.9	K	MG/KG	0.43	1
40	NBW40-DS04	INORG	Lead, total	4.2	K	MG/KG	0.41	1
40	NBW40-DS01	INORG	Magnesium, total	463	J	MG/KG	23.57	1
40	NBW40-DS02	INORG	Magnesium, total	246	J	MG/KG	23.52	1
40	NBW40-DS02P	INORG	Magnesium, total	602	J	MG/KG	20.3	1
40	NBW40-DS03	INORG	Magnesium, total	480	J	MG/KG	23.5	1
40	NBW40-DS04	INORG	Magnesium, total	230	J	MG/KG	22.07	1

Table A-3
Compounds Detected in Subsurface Soil
SWMU Supplemental Investigation and RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Value	DV_Qual	Units	Detect_Limit	Dilution_Factor
40	NBW40-DS01	INORG	Manganese, total	17.3		MG/KG	0.44	1
40	NBW40-DS02	INORG	Manganese, total	8.4		MG/KG	0.44	1
40	NBW40-DS02P	INORG	Manganese, total	18.2		MG/KG	0.38	1
40	NBW40-DS03	INORG	Manganese, total	13.3		MG/KG	0.43	1
40	NBW40-DS04	INORG	Manganese, total	8.4		MG/KG	0.41	1
40	NBW40-DS01	INORG	Nickel, total	2	J	MG/KG	1.74	1
40	NBW40-DS02P	INORG	Nickel, total	2.8	J	MG/KG	1.5	1
40	NBW40-DS03	INORG	Nickel, total	3	J	MG/KG	1.74	1
40	NBW40-DS01	INORG	Potassium, total	388	J	MG/KG	48.56	1
40	NBW40-DS02	INORG	Potassium, total	394	J	MG/KG	48.47	1
40	NBW40-DS02P	INORG	Potassium, total	414	J	MG/KG	41.83	1
40	NBW40-DS03	INORG	Potassium, total	338	J	MG/KG	48.42	1
40	NBW40-DS04	INORG	Potassium, total	218	J	MG/KG	45.47	1
40	NBW40-DS02P	INORG	Silver, total	0.85	J	MG/KG	0.17	1
40	NBW40-DS03	INORG	Thallium, total	0.67	K	MG/KG	0.55	1
40	NBW40-DS01	INORG	Vanadium, total	9.1	J	MG/KG	1.05	1
40	NBW40-DS02	INORG	Vanadium, total	8.5	J	MG/KG	1.05	1
40	NBW40-DS02P	INORG	Vanadium, total	19		MG/KG	0.9	1
40	NBW40-DS03	INORG	Vanadium, total	20.6		MG/KG	1.05	1
40	NBW40-DS04	INORG	Vanadium, total	7.5	J	MG/KG	0.98	1
40	NBW40-DS04	PEST	gamma-Chlordane	1.8	JU	UG/KG	1.8	1
40	NBW40-DS01	SVOA	bis(2-Ethylhexyl)phthalate	43	J	UG/KG	350	1
40	NBW40-DS02	SVOA	bis(2-Ethylhexyl)phthalate	72	J	UG/KG	350	1
40	NBW40-DS02P	SVOA	bis(2-Ethylhexyl)phthalate	42	L	UG/KG	370	1
40	NBW40-DS03	SVOA	bis(2-Ethylhexyl)phthalate	60	J	UG/KG	370	1
40	NBW40-DS04	SVOA	bis(2-Ethylhexyl)phthalate	39	J	UG/KG	350	1
40	NBW40-DS01	SVOA	Di-n-butylphthalate	56	J	UG/KG	330	1
40	NBW40-DS02	SVOA	Di-n-butylphthalate	54	J	UG/KG	350	1
40	NBW40-DS03	SVOA	Di-n-butylphthalate	37	J	UG/KG	370	1
40	NBW40-DS02P	VOA	Methylene Chloride	16		UG/KG	11	1
40	NBW40-DS01	VOA	Toluene	1	J	UG/KG	11	1

Table A-4
Compounds Detected in Groundwater
RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Val	DV_Qual	Units
3	NB11W1	TOTMET	Aluminum	894		UG/L
3	NB11W1	TOTMET	Calcium	130000		UG/L
3	NB11W1	TOTMET	Iron	936		UG/L
3	NB11W1	TOTMET	Magnesium	13900		UG/L
3	NB11W1	TOTMET	Potassium	23700		UG/L
3	NB11W1	TOTMET	Selenium	6		UG/L
3	NB11W1	TOTMET	Sodium	47400		UG/L
3	NB11W1	TOTMET	Zinc	37		UG/L

Table A-5
Compounds Detected in Soils
RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Val	DV_Qual	Units
2	NB10S3	PEST/PCB	4,4'-DDE	0.0019	J	MG/KG
2	NB10S3	PEST/PCB	4,4'-DDT	0.0019	J	MG/KG
2	NB10S4	PEST/PCB	4,4'-DDD	0.0033	J	MG/KG
2	NB10S4	PEST/PCB	4,4'-DDE	0.0092		MG/KG
2	NB10S4	PEST/PCB	4,4'-DDT	0.0077		MG/KG
2	NB10S4	PEST/PCB	Endrin aldehyde	0.0033	J	MG/KG
2	NB10S4	PEST/PCB	Heptahlor epoxide	0.0059		MG/KG
2	NB10D1	SVOA	Di-n-butylphthalate	0.41		MG/KG
2	NB10S1	SVOA	Benzo(a)anthracene	0.19	J	MG/KG
2	NB10S1	SVOA	Benzo(b)fluoranthene	0.48		MG/KG
2	NB10S1	SVOA	Benzo(k)fluoranthene	0.15	J	MG/KG
2	NB10S1	SVOA	Chrysene	0.3	J	MG/KG
2	NB10S1	SVOA	Fluoranthene	0.35	J	MG/KG
2	NB10S1	SVOA	Phenanthrene	0.16	J	MG/KG
2	NB10S1	SVOA	Pyrene	0.46		MG/KG
2	NB10S2	SVOA	Benzo(a)anthracene	0.13	J	MG/KG
2	NB10S2	SVOA	Benzo(a)pyrene	0.15	J	MG/KG
2	NB10S2	SVOA	Benzo(b)fluoranthene	0.3	J	MG/KG
2	NB10S2	SVOA	Benzo(k)fluoranthene	0.073	J	MG/KG
2	NB10S2	SVOA	Chrysene	0.2	J	MG/KG
2	NB10S2	SVOA	Fluoranthene	0.27	J	MG/KG
2	NB10S2	SVOA	Phenanthrene	0.18	J	MG/KG
2	NB10S2	SVOA	Pyrene	0.25	J	MG/KG
2	NB10S3	SVOA	2-Methylnaphthalene	0.049	J	MG/KG
2	NB10S3	SVOA	Anthracene	0.038	J	MG/KG
2	NB10S3	SVOA	Benzo(a)anthracene	0.13	J	MG/KG
2	NB10S3	SVOA	Benzo(a)pyrene	0.13	J	MG/KG
2	NB10S3	SVOA	Benzo(b)fluoranthene	0.26	J	MG/KG
2	NB10S3	SVOA	Benzo(g,h,I)perylene	0.13	J	MG/KG
2	NB10S3	SVOA	Benzo(k)fluoranthene	0.082	J	MG/KG
2	NB10S3	SVOA	Bis(2-ethylhexyl)phthalate	0.13	J	MG/KG
2	NB10S3	SVOA	Chrysene	0.22	J	MG/KG
2	NB10S3	SVOA	Dibenzo(a,h)anthracene	0.044	J	MG/KG
2	NB10S3	SVOA	Fluoranthene	0.2	J	MG/KG

Table A-5
Compounds Detected in Soils
RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Val	DV_Qual	Units
2	NB10S3	SVOA	Indeno(1,2,3-cd)pyrene	0.13	J	MG/KG
2	NB10S3	SVOA	Naphthalene	0.042	J	MG/KG
2	NB10S3	SVOA	Phenanthrene	0.16	J	MG/KG
2	NB10S3	SVOA	Pyrene	0.23	J	MG/KG
2	NB10S4	SVOA	Acenaphthene	0.34	J	MG/KG
2	NB10S4	SVOA	Anthracene	0.26	J	MG/KG
2	NB10S4	SVOA	Benzo(a)anthracene	1.5		MG/KG
2	NB10S4	SVOA	Benzo(a)pyrene	1.1		MG/KG
2	NB10S4	SVOA	Benzo(b)fluoranthene	2.1		MG/KG
2	NB10S4	SVOA	Benzo(g,h,I)perylene	0.97		MG/KG
2	NB10S4	SVOA	Benzo(k)fluoranthene	0.51		MG/KG
2	NB10S4	SVOA	Bis(2-ethylhexyl)phthalate	0.093	J	MG/KG
2	NB10S4	SVOA	Carbazole	0.2	J	MG/KG
2	NB10S4	SVOA	Chrysene	2		MG/KG
2	NB10S4	SVOA	Dibenzo(a,h)anthracene	0.28	J	MG/KG
2	NB10S4	SVOA	Fluoranthene	1.8		MG/KG
2	NB10S4	SVOA	Fluorene	0.072	J	MG/KG
2	NB10S4	SVOA	Indeno(1,2,3-cd)pyrene	0.9		MG/KG
2	NB10S4	SVOA	Phenanthrene	0.76		MG/KG
2	NB10S4	SVOA	Pyrene	0.11	J	MG/KG
2	NB10D1	TOTMET	Aluminum	6960		MG/KG
2	NB10D1	TOTMET	Arsenic	7.2		MG/KG
2	NB10D1	TOTMET	Calcium	674		MG/KG
2	NB10D1	TOTMET	Chromium	18.1		MG/KG
2	NB10D1	TOTMET	Copper	4.6		MG/KG
2	NB10D1	TOTMET	Iron	12500		MG/KG
2	NB10D1	TOTMET	Lead	5.5		MG/KG
2	NB10D1	TOTMET	Manganese	11.4		MG/KG
2	NB10D1	TOTMET	Mercury	0.11		MG/KG
2	NB10D1	TOTMET	Potassium	1070		MG/KG
2	NB10D1	TOTMET	Vanadium	26.4		MG/KG
2	NB10D1	TOTMET	Zinc	5.8		MG/KG
2	NB10D2	TOTMET	Aluminum	8530		MG/KG
2	NB10D2	TOTMET	Arsenic	10.8		MG/KG

Table A-5
Compounds Detected in Soils
RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Val	DV_Qual	Units
2	NB10D2	TOTMET	Cadmium	26.2		MG/KG
2	NB10D2	TOTMET	Calcium	917		MG/KG
2	NB10D2	TOTMET	Chromium	27.2		MG/KG
2	NB10D2	TOTMET	Copper	7.7		MG/KG
2	NB10D2	TOTMET	Iron	19300		MG/KG
2	NB10D2	TOTMET	Lead	8.1		MG/KG
2	NB10D2	TOTMET	Magnesium	628		MG/KG
2	NB10D2	TOTMET	Manganese	46.2		MG/KG
2	NB10D2	TOTMET	Potassium	1120		MG/KG
2	NB10D2	TOTMET	Selenium	0.99		MG/KG
2	NB10D2	TOTMET	Vanadium	35.8		MG/KG
2	NB10D2	TOTMET	Zinc	111		MG/KG
2	NB10S1	TOTMET	Aluminum	8050		MG/KG
2	NB10S1	TOTMET	Arsenic	12		MG/KG
2	NB10S1	TOTMET	Cadmium	0.64		MG/KG
2	NB10S1	TOTMET	Calcium	876		MG/KG
2	NB10S1	TOTMET	Chromium	29		MG/KG
2	NB10S1	TOTMET	Copper	8		MG/KG
2	NB10S1	TOTMET	Iron	22200		MG/KG
2	NB10S1	TOTMET	Lead	7.5		MG/KG
2	NB10S1	TOTMET	Magnesium	592		MG/KG
2	NB10S1	TOTMET	Manganese	18.3		MG/KG
2	NB10S1	TOTMET	Mercury	0.13		MG/KG
2	NB10S1	TOTMET	Potassium	1090		MG/KG
2	NB10S1	TOTMET	Selenium	1.2		MG/KG
2	NB10S1	TOTMET	Vanadium	41.5		MG/KG
2	NB10S1	TOTMET	Zinc	6.1		MG/KG
2	NB10S2	TOTMET	Aluminum	7510		MG/KG
2	NB10S2	TOTMET	Arsenic	7.9		MG/KG
2	NB10S2	TOTMET	Beryllium	0.57		MG/KG
2	NB10S2	TOTMET	Cadmium	18.6		MG/KG
2	NB10S2	TOTMET	Calcium	858		MG/KG
2	NB10S2	TOTMET	Chromium	20.1		MG/KG
2	NB10S2	TOTMET	Cobalt	5.7		MG/KG

Table A-5
Compounds Detected in Soils
RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Val	DV_Qual	Units
2	NB10S2	TOTMET	Copper	6.8		MG/KG
2	NB10S2	TOTMET	Iron	14400		MG/KG
2	NB10S2	TOTMET	Lead	8.6		MG/KG
2	NB10S2	TOTMET	Manganese	46.2		MG/KG
2	NB10S2	TOTMET	Mercury	0.12		MG/KG
2	NB10S2	TOTMET	Potassium	1010		MG/KG
2	NB10S2	TOTMET	Selenium	1.1		MG/KG
2	NB10S2	TOTMET	Vanadium	28.1		MG/KG
2	NB10S2	TOTMET	Zinc	13.7		MG/KG
2	NB10S3	TOTMET	Aluminum	4930		MG/KG
2	NB10S3	TOTMET	Antimony	7.5		MG/KG
2	NB10S3	TOTMET	Arsenic	23.2		MG/KG
2	NB10S3	TOTMET	Barium	63.7		MG/KG
2	NB10S3	TOTMET	Beryllium	0.39		MG/KG
2	NB10S3	TOTMET	Cadmium	13.1		MG/KG
2	NB10S3	TOTMET	Calcium	163000		MG/KG
2	NB10S3	TOTMET	Chromium	25.1		MG/KG
2	NB10S3	TOTMET	Cobalt	5		MG/KG
2	NB10S3	TOTMET	Copper	44.5		MG/KG
2	NB10S3	TOTMET	Iron	15600		MG/KG
2	NB10S3	TOTMET	Lead	230		MG/KG
2	NB10S3	TOTMET	Magnesium	5620		MG/KG
2	NB10S3	TOTMET	Manganese	544		MG/KG
2	NB10S3	TOTMET	Mercury	0.07		MG/KG
2	NB10S3	TOTMET	Nickel	64.3		MG/KG
2	NB10S3	TOTMET	Potassium	673		MG/KG
2	NB10S3	TOTMET	Silver	0.77		MG/KG
2	NB10S3	TOTMET	Sodium	1400		MG/KG
2	NB10S3	TOTMET	Vanadium	38.4		MG/KG
2	NB10S3	TOTMET	Zinc	615		MG/KG
2	NB10S4	TOTMET	Aluminum	8440		MG/KG
2	NB10S4	TOTMET	Antimony	41.5		MG/KG
2	NB10S4	TOTMET	Arsenic	42.5		MG/KG
2	NB10S4	TOTMET	Barium	141		MG/KG

Table A-5
Compounds Detected in Soils
RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Val	DV_Qual	Units
2	NB10S4	TOTMET	Beryllium	0.3		MG/KG
2	NB10S4	TOTMET	Cadmium	108		MG/KG
2	NB10S4	TOTMET	Calcium	3790		MG/KG
2	NB10S4	TOTMET	Chromium	46.7		MG/KG
2	NB10S4	TOTMET	Cobalt	3.8		MG/KG
2	NB10S4	TOTMET	Copper	164		MG/KG
2	NB10S4	TOTMET	Iron	16800		MG/KG
2	NB10S4	TOTMET	Lead	1320		MG/KG
2	NB10S4	TOTMET	Magnesium	1010		MG/KG
2	NB10S4	TOTMET	Manganese	332		MG/KG
2	NB10S4	TOTMET	Mercury	0.53		MG/KG
2	NB10S4	TOTMET	Nickel	58.6		MG/KG
2	NB10S4	TOTMET	Potassium	905		MG/KG
2	NB10S4	TOTMET	Selenium	0.92		MG/KG
2	NB10S4	TOTMET	Silver	9.8		MG/KG
2	NB10S4	TOTMET	Sodium	361		MG/KG
2	NB10S4	TOTMET	Vanadium	49.3		MG/KG
2	NB10S4	TOTMET	Zinc	5580		MG/KG
3	NB11S2	PEST/PCB	4,4'-DDT	0.0018	J	MG/KG
3	NB11S2	PEST/PCB	Heptahlor epoxide	0.0029		MG/KG
3	NB11S3	PEST/PCB	Heptahlor epoxide	0.017		MG/KG
3	NB11S4	PEST/PCB	Heptahlor epoxide	0.0011	J	MG/KG
3	NB11S5	PEST/PCB	4,4'-DDE	0.0025	J	MG/KG
3	NB11S5	PEST/PCB	4,4'-DDT	0.0032	J	MG/KG
3	NB11D1	SVOCS	Acenaphthene	0.16	J	MG/KG
3	NB11D1	SVOCS	Anthracene	0.28	J	MG/KG
3	NB11D1	SVOCS	Benzo(a)anthracene	1.3		MG/KG
3	NB11D1	SVOCS	Benzo(a)pyrene	1.5		MG/KG
3	NB11D1	SVOCS	Benzo(b)fluoranthene	2		MG/KG
3	NB11D1	SVOCS	Benzo(g,h,I)perylene	0.55		MG/KG
3	NB11D1	SVOCS	Benzo(k)fluoranthene	0.66		MG/KG
3	NB11D1	SVOCS	Carbazole	0.21	J	MG/KG
3	NB11D1	SVOCS	Chrysene	1.4		MG/KG
3	NB11D1	SVOCS	Dibenzofuran	0.057	J	MG/KG

Table A-5
Compounds Detected in Soils
RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Val	DV_Qual	Units
3	NB11D1	SVOCS	Fluoranthene	2.4		MG/KG
3	NB11D1	SVOCS	Fluorene	0.16	J	MG/KG
3	NB11D1	SVOCS	Indeno(1,2,3-cd)pyrene	0.55		MG/KG
3	NB11D1	SVOCS	Phenanthrene	1.1		MG/KG
3	NB11D1	SVOCS	Pyrene	2.6		MG/KG
3	NB11S1	SVOCS	Di-n-butylphthalate	0.35		MG/KG
3	NB11S2	SVOCS	2-Methylnaphthalene	0.091	J	MG/KG
3	NB11S2	SVOCS	Acenaphthene	0.16	J	MG/KG
3	NB11S2	SVOCS	Anthracene	0.34	J	MG/KG
3	NB11S2	SVOCS	Benzo(a)anthracene	0.98		MG/KG
3	NB11S2	SVOCS	Benzo(a)pyrene	0.91		MG/KG
3	NB11S2	SVOCS	Benzo(b)fluoranthene	1.2		MG/KG
3	NB11S2	SVOCS	Benzo(g,h,I)perylene	0.48		MG/KG
3	NB11S2	SVOCS	Benzo(k)fluoranthene	0.43		MG/KG
3	NB11S2	SVOCS	Carbazole	0.31	J	MG/KG
3	NB11S2	SVOCS	Chrysene	0.96		MG/KG
3	NB11S2	SVOCS	Dibenzo(a,h)anthracene	0.14	J	MG/KG
3	NB11S2	SVOCS	Dibenzofuran	0.12	J	MG/KG
3	NB11S2	SVOCS	Fluoranthene	2		MG/KG
3	NB11S2	SVOCS	Fluorene	0.2	J	MG/KG
3	NB11S2	SVOCS	Indeno(1,2,3-cd)pyrene	0.52		MG/KG
3	NB11S2	SVOCS	Naphthalene	0.16	J	MG/KG
3	NB11S2	SVOCS	Phenanthrene	1.6		MG/KG
3	NB11S2	SVOCS	Pyrene	1.7		MG/KG
3	NB11S3	SVOCS	2-Methylnaphthalene	0.063	J	MG/KG
3	NB11S3	SVOCS	Acenaphthene	0.58		MG/KG
3	NB11S3	SVOCS	Anthracene	1.2		MG/KG
3	NB11S3	SVOCS	Benzo(a)anthracene	4.3		MG/KG
3	NB11S3	SVOCS	Benzo(a)pyrene	4.2		MG/KG
3	NB11S3	SVOCS	Benzo(b)fluoranthene	5		MG/KG
3	NB11S3	SVOCS	Benzo(g,h,I)perylene	2.1		MG/KG
3	NB11S3	SVOCS	Benzo(k)fluoranthene	1.9		MG/KG
3	NB11S3	SVOCS	Bis(2-ethylhexyl)phthalate	0.18	J	MG/KG
3	NB11S3	SVOCS	Carbazole	0.22	J	MG/KG

Table A-5
Compounds Detected in Soils
RRR Study

SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Val	DV_Qual	Units
3	NB11S3	SVOCS	Chrysene	4.4		MG/KG
3	NB11S3	SVOCS	Dibenzo(a,h)anthracene	0.41		MG/KG
3	NB11S3	SVOCS	Dibenzofuran	0.3	J	MG/KG
3	NB11S3	SVOCS	Fluoranthene	7.4		MG/KG
3	NB11S3	SVOCS	Fluorene	0.24	J	MG/KG
3	NB11S3	SVOCS	Indeno(1,2,3-cd)pyrene	2.3		MG/KG
3	NB11S3	SVOCS	Naphthalene	0.1	J	MG/KG
3	NB11S3	SVOCS	Phenanthrene	3.4		MG/KG
3	NB11S3	SVOCS	Pyrene	7.1		MG/KG
3	NB11S4	SVOCS	Acenaphthene	0.042	J	MG/KG
3	NB11S4	SVOCS	Anthracene	0.051	J	MG/KG
3	NB11S4	SVOCS	Benzo(a)anthracene	0.21	J	MG/KG
3	NB11S4	SVOCS	Benzo(a)pyrene	0.26	J	MG/KG
3	NB11S4	SVOCS	Benzo(b)fluoranthene	0.23	J	MG/KG
3	NB11S4	SVOCS	Benzo(g,h,I)perylene	0.18	J	MG/KG
3	NB11S4	SVOCS	Benzo(k)fluoranthene	0.11	J	MG/KG
3	NB11S4	SVOCS	Chrysene	0.26	J	MG/KG
3	NB11S4	SVOCS	Fluoranthene	0.34	J	MG/KG
3	NB11S4	SVOCS	Indeno(1,2,3-cd)pyrene	0.17	J	MG/KG
3	NB11S4	SVOCS	Phenanthrene	0.3	J	MG/KG
3	NB11S4	SVOCS	Pyrene	0.54		MG/KG
3	NB11S5	SVOCS	Benzo(a)anthracene	0.038	J	MG/KG
3	NB11S5	SVOCS	Benzo(a)pyrene	0.036	J	MG/KG
3	NB11S5	SVOCS	Benzo(b)fluoranthene	0.052	J	MG/KG
3	NB11S5	SVOCS	Benzo(k)fluoranthene	0.063	J	MG/KG
3	NB11S5	SVOCS	Chrysene	0.064	J	MG/KG
3	NB11S5	SVOCS	Fluoranthene	0.081	J	MG/KG
3	NB11S5	SVOCS	Phenanthrene	0.04	J	MG/KG
3	NB11S5	SVOCS	Pyrene	0.092	J	MG/KG
3	NB11S2	TOTMET	Aluminum	4430		MG/KG
3	NB11S2	TOTMET	Arsenic	5		MG/KG
3	NB11S2	TOTMET	Barium	18		MG/KG
3	NB11S2	TOTMET	Beryllium	0.19		MG/KG
3	NB11S2	TOTMET	Calcium	1330		MG/KG

Table A-5
Compounds Detected in Soils
RRR Study

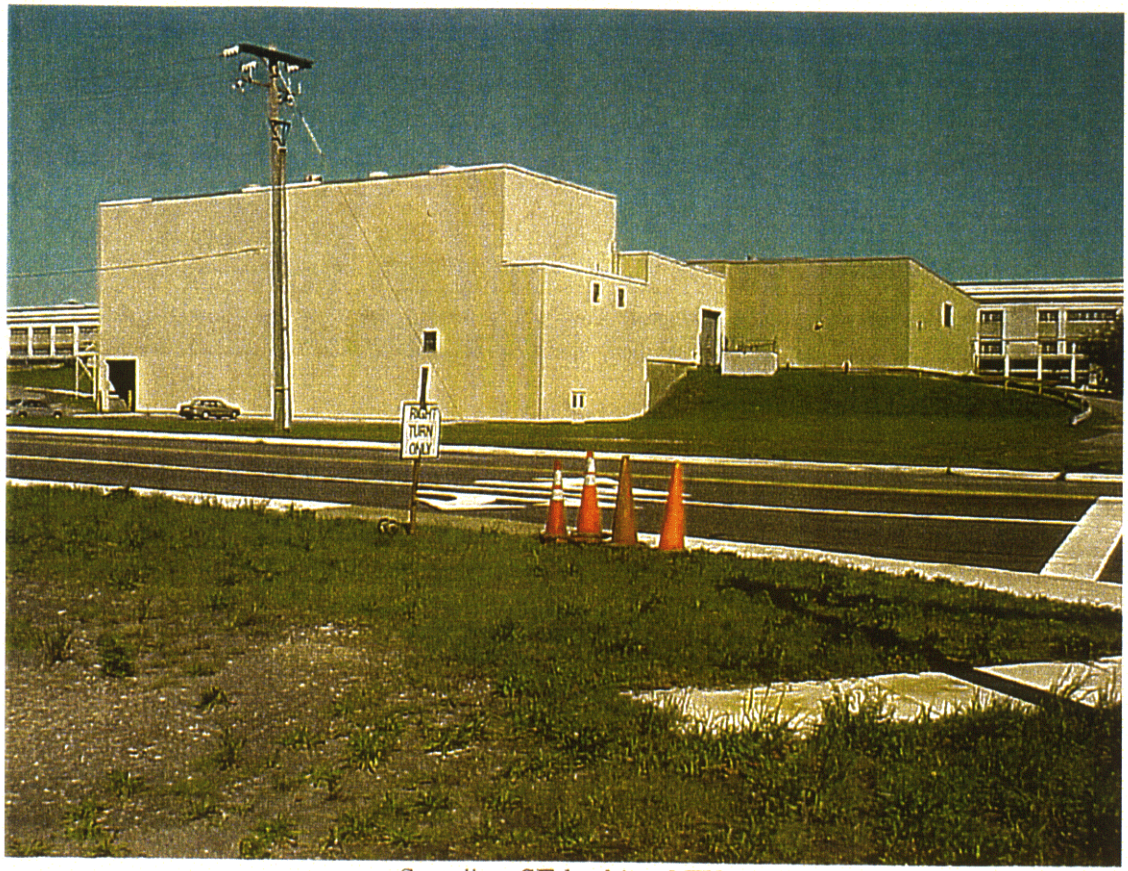
SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Val	DV_Qual	Units
3	NB11S2	TOTMET	Chromium	6.9		MG/KG
3	NB11S2	TOTMET	Cobalt	1.2		MG/KG
3	NB11S2	TOTMET	Copper	5.3		MG/KG
3	NB11S2	TOTMET	Iron	5620		MG/KG
3	NB11S2	TOTMET	Lead	28.1		MG/KG
3	NB11S2	TOTMET	Magnesium	656		MG/KG
3	NB11S2	TOTMET	Manganese	47.1		MG/KG
3	NB11S2	TOTMET	Potassium	777		MG/KG
3	NB11S2	TOTMET	Sodium	26.1		MG/KG
3	NB11S2	TOTMET	Vanadium	11.2		MG/KG
3	NB11S2	TOTMET	Zinc	17.5		MG/KG
3	NB11S3	TOTMET	Aluminum	8350		MG/KG
3	NB11S3	TOTMET	Arsenic	5.1		MG/KG
3	NB11S3	TOTMET	Barium	59.4		MG/KG
3	NB11S3	TOTMET	Beryllium	1		MG/KG
3	NB11S3	TOTMET	Calcium	3920		MG/KG
3	NB11S3	TOTMET	Chromium	8.7		MG/KG
3	NB11S3	TOTMET	Cobalt	4		MG/KG
3	NB11S3	TOTMET	Copper	10.1		MG/KG
3	NB11S3	TOTMET	Iron	13500		MG/KG
3	NB11S3	TOTMET	Lead	26		MG/KG
3	NB11S3	TOTMET	Magnesium	3030		MG/KG
3	NB11S3	TOTMET	Manganese	197		MG/KG
3	NB11S3	TOTMET	Nickel	4.3		MG/KG
3	NB11S3	TOTMET	Potassium	3180		MG/KG
3	NB11S3	TOTMET	Sodium	125		MG/KG
3	NB11S3	TOTMET	Vanadium	27.5		MG/KG
3	NB11S3	TOTMET	Zinc	47.9		MG/KG
3	NB11S4	TOTMET	Aluminum	2780		MG/KG
3	NB11S4	TOTMET	Arsenic	2.3		MG/KG
3	NB11S4	TOTMET	Barium	19.2		MG/KG
3	NB11S4	TOTMET	Cadmium	1		MG/KG
3	NB11S4	TOTMET	Calcium	1170		MG/KG
3	NB11S4	TOTMET	Chromium	4.7		MG/KG

Table A-5
Compounds Detected in Soils
RRR Study

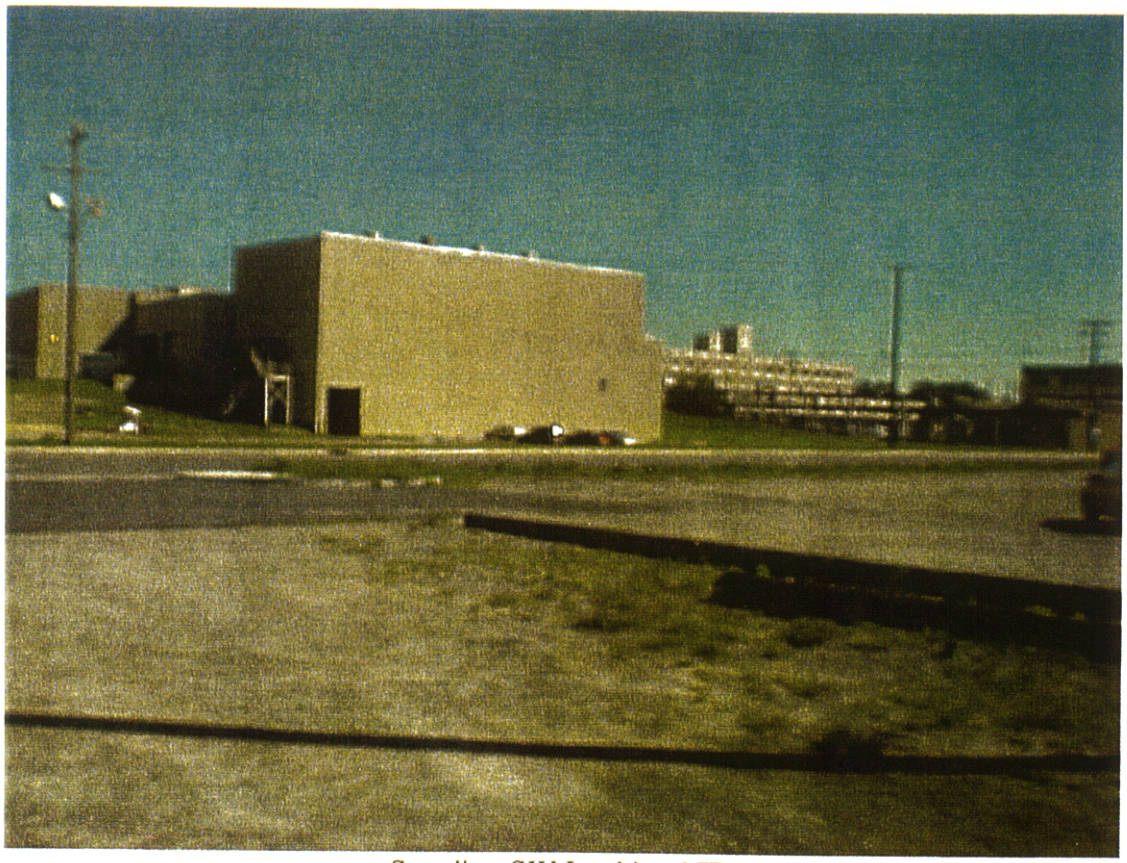
SWMUID	Sample_ID	Sample_Analysis	Chem_Name	Ana_Val	DV_Qual	Units
3	NB11S4	TOTMET	Cobalt	0.91		MG/KG
3	NB11S4	TOTMET	Copper	23.8		MG/KG
3	NB11S4	TOTMET	Iron	3520		MG/KG
3	NB11S4	TOTMET	Lead	37.1		MG/KG
3	NB11S4	TOTMET	Magnesium	451		MG/KG
3	NB11S4	TOTMET	Manganese	77.9		MG/KG
3	NB11S4	TOTMET	Nickel	5.9		MG/KG
3	NB11S4	TOTMET	Potassium	406		MG/KG
3	NB11S4	TOTMET	Sodium	54.4		MG/KG
3	NB11S4	TOTMET	Vanadium	7.2		MG/KG
3	NB11S4	TOTMET	Zinc	67.5		MG/KG
3	NB11S5	TOTMET	Aluminum	2120		MG/KG
3	NB11S5	TOTMET	Antimony	2.9		MG/KG
3	NB11S5	TOTMET	Arsenic	21.3		MG/KG
3	NB11S5	TOTMET	Barium	24.5		MG/KG
3	NB11S5	TOTMET	Beryllium	0.15		MG/KG
3	NB11S5	TOTMET	Cadmium	0.68		MG/KG
3	NB11S5	TOTMET	Calcium	306000		MG/KG
3	NB11S5	TOTMET	Chromium	17.3		MG/KG
3	NB11S5	TOTMET	Cobalt	2.3		MG/KG
3	NB11S5	TOTMET	Copper	8.4		MG/KG
3	NB11S5	TOTMET	Iron	11300		MG/KG
3	NB11S5	TOTMET	Lead	17.2		MG/KG
3	NB11S5	TOTMET	Magnesium	2500		MG/KG
3	NB11S5	TOTMET	Manganese	151		MG/KG
3	NB11S5	TOTMET	Nickel	4.7		MG/KG
3	NB11S5	TOTMET	Potassium	593		MG/KG
3	NB11S5	TOTMET	Sodium	2740		MG/KG
3	NB11S5	TOTMET	Vanadium	32		MG/KG
3	NB11S5	TOTMET	Zinc	41.1		MG/KG
3	NB11S3	VOCS	Acetone	0.02		MG/KG
3	NB11S4	VOCS	Benzene	0.003	J	MG/KG

Appendix B:
SWMU Photographs

SWMUs 2 and 3 – Building Z-309



Standing SE looking NW



Standing SW Looking NE

SWMU 2: Bldg Z 309 Ash Hopper Storage Area
SWMU 3: Bldg Z309 Oil/Lube Storage Area
Naval Station Norfolk

SWMU 40 – MCA 603 Pits

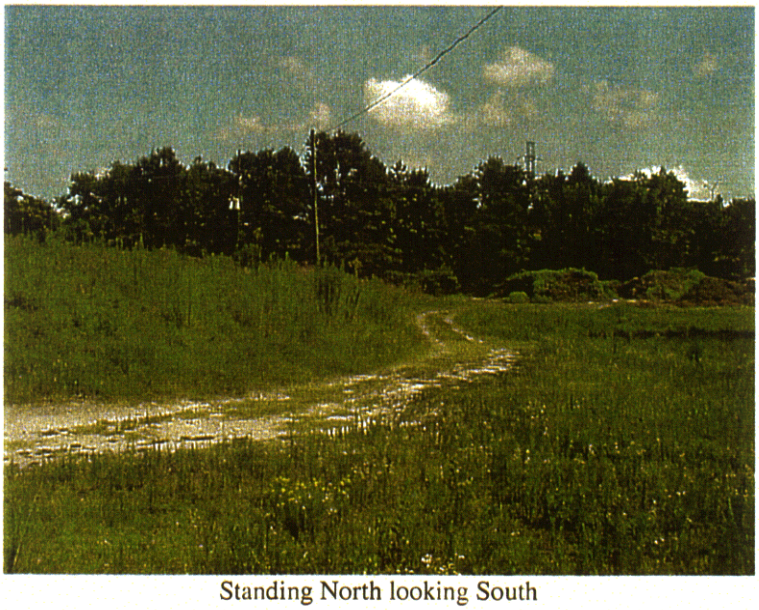
Standing NE looking SW towards site (8/04/99)

Standing NW looking SE toward site

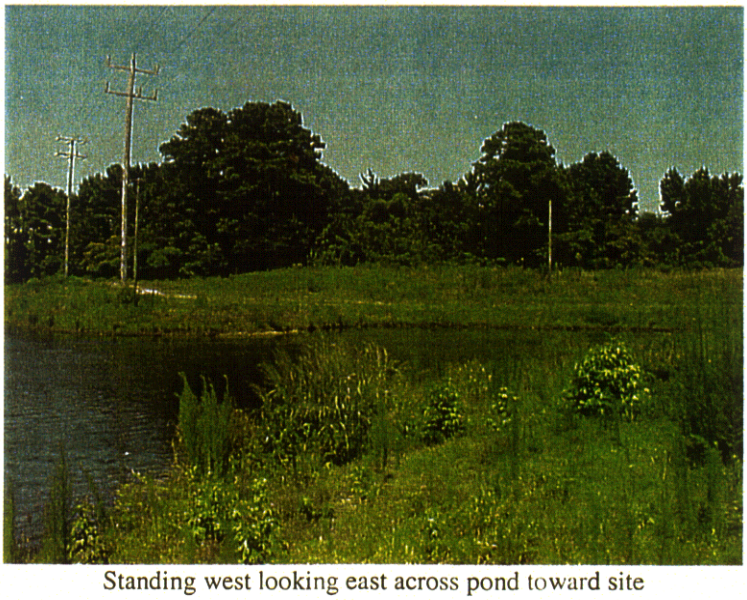
Standing in south corner of site looking north

SWMU 41 – CA-99 Golf Course on 8/4/99

Standing South corner looking north



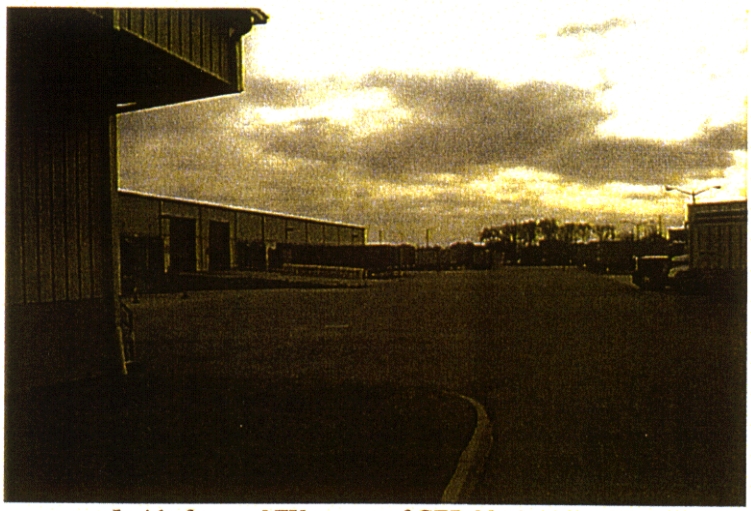
Standing North looking South



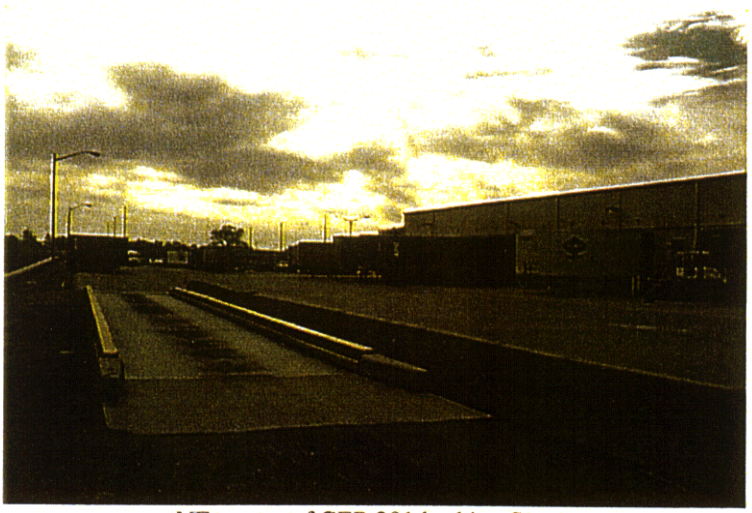
Standing west looking east across pond toward site

SWMU 42 – CEP 201 Area

Outside fence - NW corner of CEP 201 looking SE



Inside fence - NW corner of CEP 201 looking SE



NE corner of CEP 201 looking South